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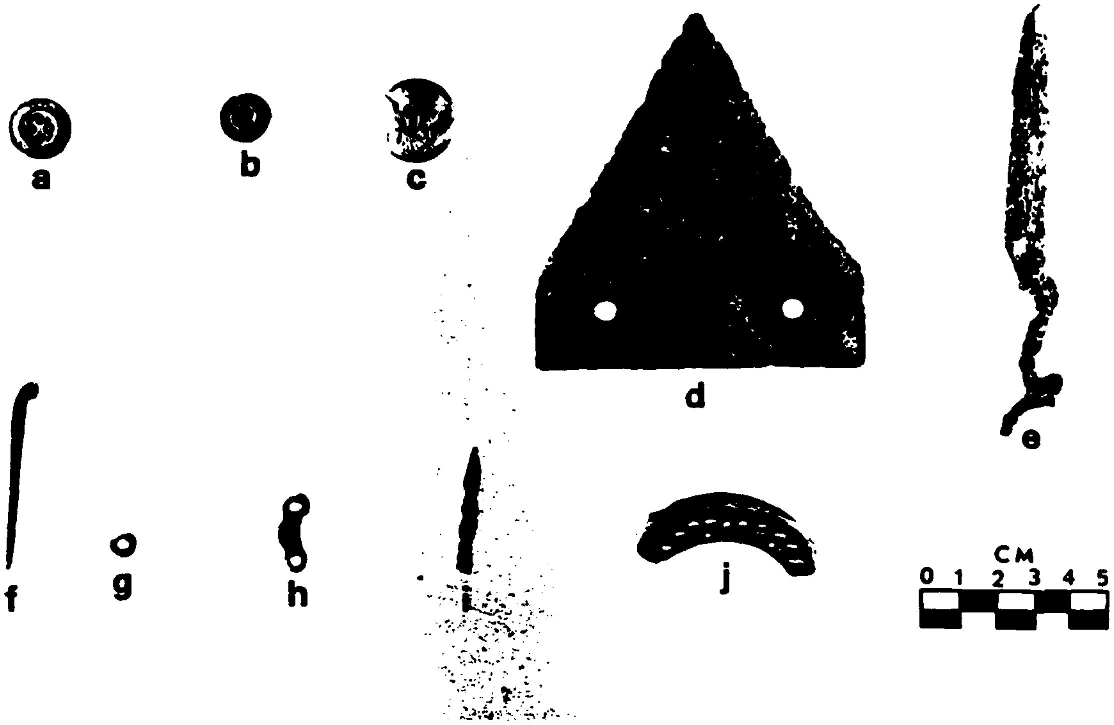

Figure 9.22. Photograph of metal artifacts from 14BU1004.
a. button (A90426020103): b. button (A90406030003):
c. Phoenix button (A90411010001); d. sickle mower blade
(A90408010001); 3. pointed scissors (A90425010059):
f. ivory comb tooth (A90425030020); g. brass eyelet
(A90405020072); h. brass watch bog (A90405020019):
i. drill bit point (A90408020026); j. brass piece
(A90406020030).

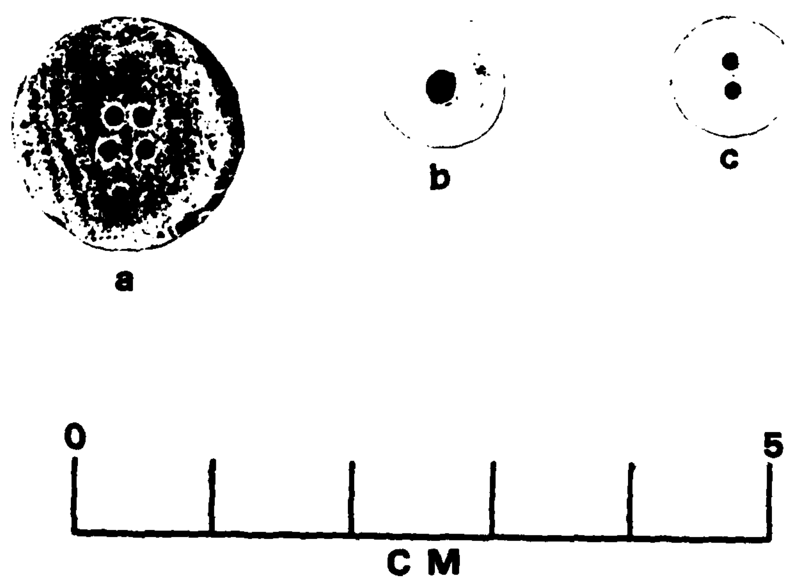

Figure 9.23. Buttons and bead recovered from 14BU1004.
a. shell button (A90423020065);
b. globular glass bead (A90425020043);
c. button made of milk glass (A90424010023).

Miscellaneous Brass and Copper Artifacts (n=7)

This category includes one small piece of copper wire with a diameter of 1.2 mm.; one brass clad, iron pipe measuring 23.0 mm. long and with an exterior diameter of 6.3 mm.; one brass washer measuring 12.2 mm. in diameter with a 4.0 mm. diameter center hole; one brass pin measuring 33.7 mm. long, 1.8 mm. wide, and 0.8 mm. thick; one brass eyelet with fragments of leather attached which is probably from a shoe (Fig. 22g); one brass, unidentifiable artifact, with two eyelets which may be from a shoe or watch bob (Fig. 22h); one brass, unidentifiable artifact with randomly placed holes and the following stamped letters: "OO ONTA OT." (Fig. 22j).

Buttons (n=6)

This category includes one white shell button with four attachment holes in the center which measures 16.3 mm. in diameter and 1.7 mm. thick (Fig. 23a): one milk glass, two hole button measuring 8.5 mm. in diameter and 2.4 mm. thick (Fig. 23c); one hard rubber, two hole button measuring 13.8 mm. in diameter and 4.7 mm. thick with the raised letters N.R. Co. / GOODYEAR SPT. on the obverse (Fig. 20f); one two-piece iron and brass button with four attachment holes in the center and measuring 17.2 mm. in diameter and 2.9 mm. thick (Fig. 22a); one fragmentary, two-piece iron and brass button with an attachment on the back (Fig. 22b); and one brass, army infantry Phoenix button measuring 23.0 mm. in diameter and 12.1 mm. thick with an attachment on the back with SCOVILL MF'G Co. / WATERBURY (Fig. 22c) stamped on the obverse, dating the button later than 1850 (Woodward 1976).

Buckles (n=5)

This category includes four iron buckles which vary in width from 22.3 mm. to 35.7 mm. and 3.4 mm. to 6.0 mm. thick (Fig. 21e). One fragment of an iron buckle was also recovered. These could either have been articles of human clothing or parts of a harness.

Bolts and Nuts (n=4)

Included in this category are: one complete, hand-forged, iron I-bolt measuring 111.7 mm. long, 32.8 mm. wide and with a 14.4 mm. diameter shaft (Fig. 21j); one complete, iron, bolt with a butterfly head measuring 84.0 mm. long and 12.4 mm. in diameter (Fig. 20g, Fig. 21i); one iron, hexagonal, 3/8 inch nut; and one fragment of a bolt shaft measuring 6.0 mm. in diameter and 31.1 mm. long.

Nails (n=533)

This category includes 532 square-cut nails of various sizes and one wire nail of indeterminant size. The square-cut nails are of the following sizes:

	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d	12d	16d	indeterminate
quantity	4	17	39	55	17	18	9	21	6	8	5	1	332

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Window Glass (n=272)

This category is further divided into three color types: clear (83); green tint (181); and aqua (8).

Bottle Glass (n=567)

This category is further divided into eight color types: aqua (201); amber (67); clear (176); light manganese (53); olive green (3); green tint (62); sea green (3); and milk (2).

Several larger pieces of bottle glass have characteristic features. Two are amber colored fragments, one with the raised letter "E" and a second, a rim, with an orifice of 18.3 mm. The rim has an applied, oil finish top (type 9) (Fig. 20a). The mold seam extends to the base of the rim, placing manufacture of the bottle between 1880 and 1900 (Adams 1971).

Ten of the 201 aqua colored fragments have characteristic features. Two fragments include one round base with a pontill mark and kickup and one rectangular base with no kickup. Identification marks are absent. One fragment has the raised letters ELD'S / SYRUP and is probably a patent medicine bottle.

Seven aqua colored rim fragments were recovered. One is from a mason jar with exterior threads and an orifice of 70.0 mm. The second is a bottle rim with a recessed lip (type 6) and an orifice of 20.0 mm. The third has a packer top (type 3) and an orifice of 9.2 mm. (Fig. 20b). The fourth has an extracted top (type 7) and an orifice of 11.1 mm. (Fig. 20e). The lip has been applied, making the manufacture of the bottle at least pre-1900 (Adams 1971). The fifth has a blob top (type 1) and an orifice diameter of 15.0 mm. The sixth rim has a blob top and the seventh is a lip fragment. Both are too fragmentary to determine orifice diameters.

Six of the 176 fragments of clear glass have characteristic features. Three are straight rims (type 4) and are probably from a bowl. The fourth has an incurvate rim with a flat lip (type 6) (Fig. 20d) and the fifth has an extract top (type 8) and an orifice diameter of 15.0 mm. The sixth is a fragment of pressed glass.

Three of the 53 fragments of light manganese colored glass have characteristic features. Two are pieces of pressed glass with a sunburst design. The third is a fragment of a bowl with a straight rim (type 4).

Faunal Remains

A small quantity of bone fragments (total 21.8 grams) was recovered from throughout the test excavations. Only two bones were identifiable to species. One is a nearly complete left radius of a domestic chicken *(Gallus gallus)*, and the second is a left maxilla fragment of a domestic pig *(Sus scrofa)*. The maxilla is an anterior fragment with the P 2-4 present. The teeth appear to be deciduous.

University of Kansas

Museum of Anthropology

Project Report Series

Number 51

(12)

ARCHAEOLOGICAL INVESTIGATION AT EL DORADO LAKE, BUTLER COUNTY, KANSAS (Phase III)

Funded by the U.S. Army Corps of Engineers

(Tulsa District) Contract No. DACW56-77-C-0221

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1982

Summary

The large quantity and variety of cultural remains recovered from the Osborn log cabin site allow the following inferences:

(1) The cabin was constructed prior to the development and availability of wire nails. The general absence of wire nails indicates the log cabin was either moved from the original location or was never modified in the latter part of the 19th century when wire nails became available.

(2) Some of the household hardware, such as door locks and pulleys were made locally by a blacksmith.

(3) Phineas Osborn or some other resident of the log cabin smoked a tobacco pipe (See Anderson, this volume).

(4) The recovery of a portion of a ceramic doll indicates a child or children were residents of the cabin.

(5) The army, infantry, Phoenix button indicates Phineas Osborn or some other adult male resident had served in the army, probably during the Civil War.

(6) The large quantity of earthenware and stoneware of large crockery vessels suggests the residents were engaged in the production of dairy products, particularly cheese.

(7) The low frequency of high status items, such as porcelain wares and items manufactured of brass and copper, indicate the general low economic status of the residents.

(8) On the basis of seam marks on two bottle fragments, the site was not occupied after 1903.

14BU1008 - The Donaldson House

The Donaldson house, 14BU1008 (Fig. 24) is situated on the floodplain of Durechen Creek. The area immediately around the site is in pasture and cultivation. The site is to be inundated by El Dorado Lake.

History

The cut limestone house at 14BU1008 was built by George T. Donaldson in 1869 and used as a family dwelling until 1974. George Donaldson was born in Mushingham County, Ohio and moved to Jefferson County, Kansas in 1855 (Andreas 1883:1450). He took an active part in sustaining free-state principles in Kansas.

Donaldson moved his family to Butler County in 1857 and joined a small

ABSTRACT

With funding provided by means of Contract No. DACW56-77-0221 with the U.S. Army Corps of Engineers (Tulsa District), archaeological field crews from the Museum of Anthropology at the University of Kansas conducted investigations at El Dorado Lake, Butler County, south-central Kansas during the summer of 1979. The 1979 investigations were a continuation of a project begun in 1977, and conducted according to a research design developed in 1976 which specified a focus on an attempt to explain local prehistoric and historic cultural developments as, at least in part, adaptations to the local natural environment and changes in that environment through time. The present report describes the results of the 1979 effort which involved geomorphological research, excavations at six prehistoric components (three Late Archaic and three Woodland), historic archival work, and investigations at five sites of the historic period. Contributions of the research include a better understanding of the dynamics of human subsistence and settlement patterns from ca. 3000 B.C. to A.D. 1000, a period which apparently witnessed significant climatic change and as well the introduction of several important technological innovations including agriculture, the bow-and-arrow, and pottery vessels. No less important is the enhanced understanding of the historic period resulting from the utilization of archaeological techniques to supplement the documentary record. This disciplinary cross-fertilization resutled in the acquisition of data helpful in understanding the adaptation of the Euroamerican settlers to their environment, the economic networks that were operating, and the social systems that existed.

band in Emporia that would eventually settle the town of Chelsea. The Donaldsons selected a farm near Durechen Creek and constructed a log cabin which they occupied until 1869. Donaldson expanded his farm to include finally 800 acres, part of which was the site for the town of New Chelsea (Fisher 1930:33).

Donaldson began construction of the presently standing stone house in 1869. The stone house stands north and east of the original log cabin and was apparently near completion at the time of George Donaldson's death on November 3, 1869 (Stratford 1934:24). Mrs. Donaldson and her family continued to reside in the stone house until her death in 1883 (Walnut Valley Times, August 31, 1883). In 1883 the ownership of the house was transferred to J. S. Saxby, the first minister to serve the Chelsea community in the late 1850's. Between 1886 and 1905 the property was owned by T. W. Holderman. At least one tenant family, the Sontag's, lived there during Holderman's ownership. In 1946 Glen Lucas, with his brother Avery, bought the farm and lived in the house until 1973 when the U. S. Army Corps of Engineers purchased the property (Site Survey Form, 1978).

The Donaldson stone house is a two story, north facing limestone structure. Wall construction is not solid; two walls (inner and outer) were constructed of semi-finished cut limestone reinforced by saw-milled beams and cement. Rubble fill was placed between the inner and outer walls. The corners of the house are quoined, with the width of the walls varying from 45 cm. to 60 cm. (Roberts and Wilk n.d.).

This site is significant because of its long history in the area, having been built by one of the earliest and most prominent settlers in Butler County. Further archaeological investigations were warranted for this site in order to obtain a representative sample of artifacts which would allow interpretations to be made as to the economic status and networks operating in the area for 104 years (1869-1973).

Surface Collection

Upon initial examination of the site in 1979, a medicine bottle of light manganese colored glass and one .25-20 spent cartridge case were recovered from exposed soils on the east side of the house.

Test Excavations

With the aid of infra-red areal photographs, it was determined that two rectangular areas, east and north of the stone house, would most likely yield cultural materials helpful in determining past economic activities and social status of previous residents. The infra-red areal photographs depicted disturbed soils in these two rectangular areas, suggesting refuse disposal areas or places where old out-buildings once stood (Fig. 24).

PREFACE

As a continuation of a project begun in 1977, with the support of the U.S. Army Corps of Engineers (Tulsa District), field crews from the Museum of Anthropology at the University of Kansas conducted archaeological field work at El Dorado Lake, Butler County, Kansas, during the summer of 1979. This period of data recovery was a portion of the Phase III effort on the part of the Corps and the Museum to mitigate the effect of dam construction on the local prehistoric and historic cultural resources. Field work was followed by a longer period of laboratory data analysis resulting in the present manuscript describing the results of the effort. Results of Phases I and II of the El Dorado Lake project are available in Leaf (1979) and Adair (1981). Phase IV involved field and laboratory studies during 1980, and a report on this work, including a summary of the activities of all four phases is also available (Johnson 1981).

During the course of the four phases of archaeological work at El Dorado Lake, and in so far as possible, within constraints imposed by restricted funding, time, and personnel availability, the Museum adhered to an overall program set forth in a comprehensive research design (Leaf (1976). Principle goals of the project were: "(1) to retrieve data and test hypotheses on prehistoric subsistence and settlement systems; and, (2) to conduct an interdisciplinary program to retrieve data and test models of paleoenvironments useful for the study of prehistoric cultural-ecological relationships. Operationally, these enquiries are organized in such a manner as to maximize the rescue of relevant data from the present to the time of dam closure in 1980" (Leaf 1979:1).

A major thrust of the focus on modeling paleoenvironments of the El Dorado area involved research in geology, geomorphology, and soil science. Earlier reports include descriptions of pre-field work library research on these topics (Drew 1979) and of a working model of the local paleogeography based on field investigations (Drew 1981). Chapter 1 of the present report, also by Darrell Drew, builds on this background by presenting information on laboratory analyses of sediments collected at El Dorado Lake, and on experimental studies which assess the potential of the use of available coring records for the creation of maps of the bedrock surface and the alluvial valley fill. Emphasis is on the earlier portion of the alluvial sequence. Another report, soon to be completed, will detail the nature of later portions of this sequence which include artifacts.

In part, our understanding of the nature of the later portion of the alluvial sequence at El Dorado Lake is based on excavations at 14BU4, the Nuttal site. Nuttal was first tested in 1974, a test which confirmed the presence of two components, one assignable to the Plains Woodland tradition, at and near the surface, and a second of Late Archaic Chelsea phase affiliation (Fulmer 1976), buried in a paleosol which appears at several other sites in the El Dorado Lake area, including the Milbourn and Snyder sites (see following). A focus of the work at Nuttal in 1979, described by Joe Artz in Chapter 2, was the deliniation of intra-site spatial patterns, and this orientation led to the demonstration that the Plains Woodland component represented a series of short-term occupations along the

These two areas were in tall grasses and weeds, so mowing was our first step in studying the site. A datum marker (100 meters east, 100 meters north, 0 meters vertical) was established on what was believed to have been the northeast corner of the yard surrounding the house. All subsequent provenience information was related to this datum. A Cartesian coordinate grid was superimposed over the site. Initial test excavations consisted of a single north-south trench, one meter wide and 10 meters long, along the 100 meter east line and extending from 82 to 92 meters north (Figs. 25 and 26). This initial trench was placed in the eastern area interpreted as having disturbed soils.

Prior to the excavation of a unit, the ground surface elevation in the southwest corner of the unit was determined relative to the datum. A total of 32, one meter square, units were dug. The initial 1 by 10 meter trench was dug to a depth of 30 cm. Most cultural remains diminished in frequency at 20 to 30 cm. The large quantity of cultural remains recovered from the trench warranted expansion of the trench in easterly and westerly directions.

Two features were exposed (Fig. 27). Feature 1, a hearth, was located in excation unit one (Fig. 28a) at a depth of 19 cm. below surface. It consisted of charcoal flecks. The hearth was circular (21 cm. in diameter) and was basin shaped (8 cm. deep). Preservation was fair with some tree root disturbance. One identifiable cultural artifact, a fragment of amber colored bottle glass with the raised letter BEGGS DEL is probably a patent medicine bottle sold by Begg's dating between 1885 and 1900 (Baldwin 1973:61).

Feature 3 (Fig. 28b), a post stain and supporting stones, was encountered in excavation unit 13. The feature consisted of rock and brick fragments placed around what appears to have been a 17 cm. diameter post. The feature was circular in shape, measuring 51 cm. in a southwest-northeast direction and 41 cm. in a northwest-southeast direction. The vertical depth of the post stain extended 55 cm. below the ground surface. Preservation of feature three was excellent with no discernible rodent or tree root disturbance. Adjacent to the rock and brick concentration was a round, one gallon, iron container with a wire handle. The container was standing upright. It measures 21 cm. high and 16 cm. in diameter. The base of the container was 30 cm. below ground surface.

Upon completing units 1-15 to a depth of 30 cm., a second trench was dug north of the stone house in an area believed to have been disturbed soils. A 1 by 8 m^2 trench was located along the 91 north meter line, extending from 80 to 88 meters east within the Cartesian coordinate system (Fig. 26). Excavation units 16-22 were dug to a depth of 20 cm. One excavation unit, number 23, was dug to a depth of 40 cm. The general lack of cultural remains did not warrant further excavation in the north test trench.

Excavations were expanded in the original test trench east of the stone house. An additional 9 m^2 were dug (Fig. 26). Since it was previously determined that cultural remains were concentrated within the first 20 cm., these nine additional units were excavated to a depth of 20 cm.

well-drained crest of an abandoned levee, while the Chelsea phase occupation was probably "by a small group of hunters who used the site for a brief episode of flint knapping, most likely for the purpose of making and curating hunting tools" (Artz this volume).

Chapter 3 is a comprehensive report on the important Late Archaic

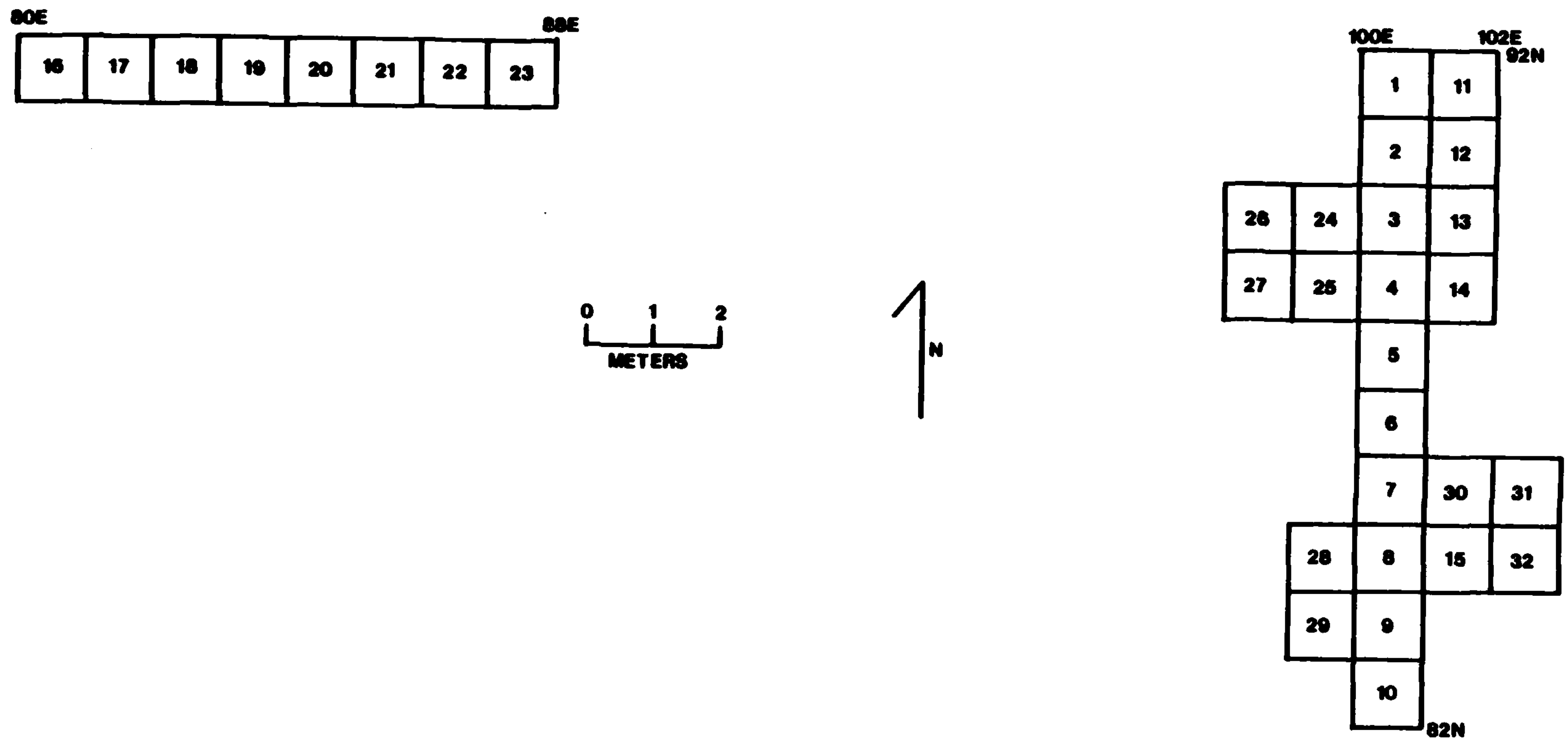


Figure 9.26. Schematic map showing the unit numbers of the test units excavated at 14BU1008.

to an understanding of the culture history of the Central Plains as it is an example of a transitional period from the Plains Woodland to the Plains Village traditions. In addition, large-scale water flotation of soil samples from the site has provided floral remains demonstrating that agriculture was important to the Central Plains subsistence base by A.D. 1000±25. Chapter 6 of the present report, by Mary Adair, presents additional information on the prehistoric occupation of Two Deer, resulting from an analysis of the relationships observable in the intra-site distribution of features and artifacts.

Survey work in 1977, called attention to the potential significance of archaeological research in the El Dorado Lake area for an understanding of local history as a special case of the general development of the Euro-American settlement of North America. As a consequence, a program of historic sites archaeology was instituted in 1978, and continued to the end of the project in 1981. Approaches included oral and archival research, by historians, such as Chapter 7 of the present volume by Floyd Thomas. Chapter 7 presents a history of the failure of the town of Chelsea, once a thriving community situated near the northern boundary of El Dorado Lake. Questions raised by Thomas' work were, in part, the stimulus for archaeological excavations at Chelsea, described in Chapter 10 of this volume and in the report on the Phase IV investigations at El Dorado Lake (Roberts 1981).

A consequence of excavations in sites of the historic period at El Dorado was the retrieval of sizeable samples of sherds of ceramic vessels. Following discussion of preliminary research necessary to solve identification problems, Elizabeth Anderson, in Chapter 8, describes and tabulates the ceramics recovered from six historic sites including examples of most of the historic site types in the El Dorado Lake area: a log cabin, farm homes, outbuildings, businesses, and a town.

Important among the research goals of the historic sites archaeological program at El Dorado Lake were, "acquisition of data helpful in understanding the adaptations of the settlers to their environment, the economic networks that were operating, and the social systems that existed" (Brown 1981). It was hoped that four sites investigated in 1979, the original town site of Chelsea, Fort Bend, the Osborn log cabin, and the Donaldson stone house, would all produce data applicable to these problem domains. Work accomplished demonstrated that the original Chelsea site was not within the federal project boundaries and that Fort Bend was no longer in existence. Useful data relating to the problems listed were forthcoming from the other two sites, and these are presented in detail in Chapter 9 by Kenneth Brown.

Chapter 10, by Ricky Roberts, concludes the description of the work

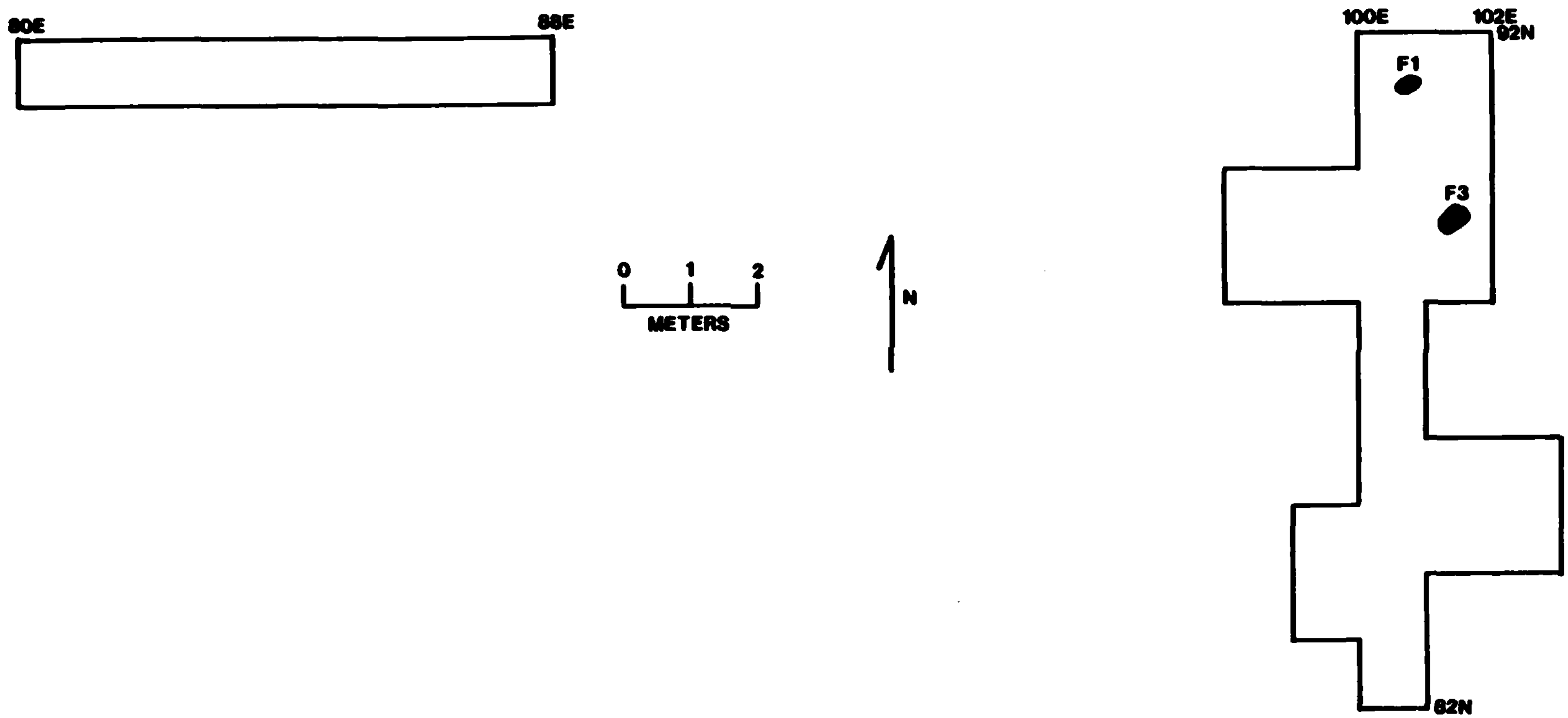
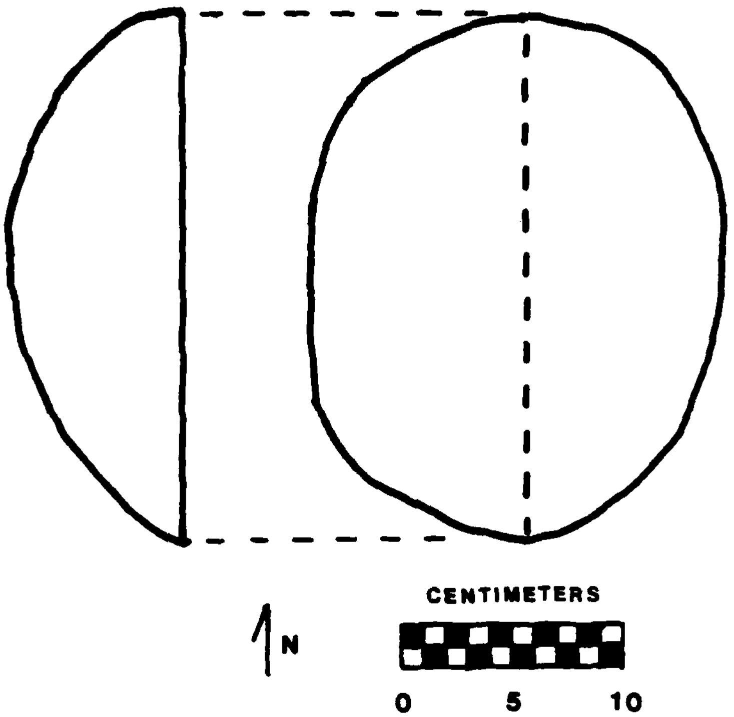


Figure 9.27. Map showing the location of features at 14BU1008.



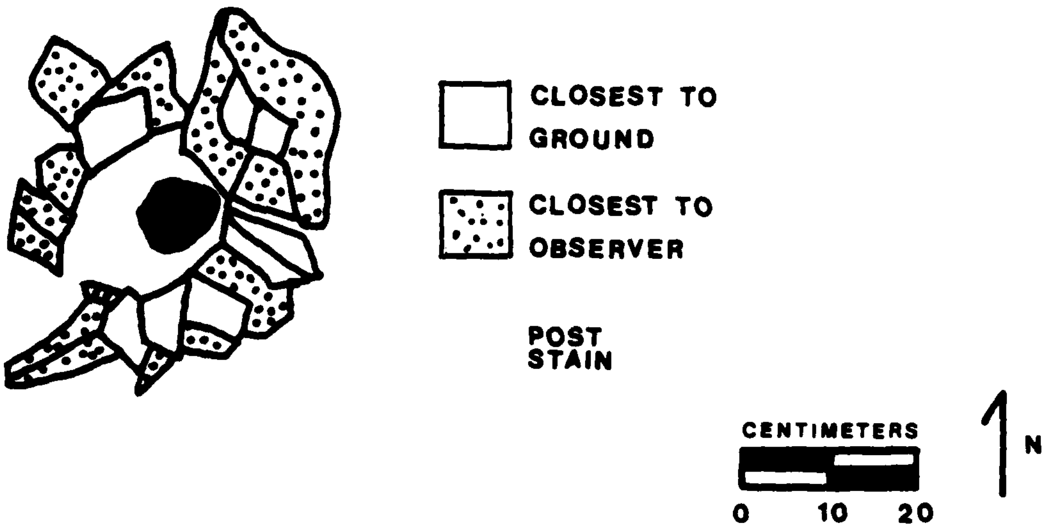


Figure 9.28. Schematic maps showing the configurations of the two features at 14BU1008. a. feature 1, b. feature 3.

Leaf, G.R.
1976 An Archaeological Research Design and Salvage Mitigation Plan for the El Dorado Reservoir, Butler County, Kansas. Department of the Interior, National Park Service, Interagency Archaeological Services, Office of Archaeological and Historic Preservation. Denver, Colorado.

Roberts, R.L.

These excavations yielded large quantities of cultural remains, consisting mostly of bottle glass, window glass, ceramics, nails, plastic and personal items such as buttons, belt buckles, and girdle and suspender fasteners.

Figures 29 to 37 show distributions of some of the more numerous artifact types within the test excavations. Figure 29 shows the distribution of square-cut nails. Most square-cut nails occur in the south half of the east excavation. In contrast, wire nails (Fig. 30) occur throughout the excavation.

Figure 31 shows the distribution of window glass. Most window glass occurs in the southern portion of the excavation, similar to that of square-cut nails. Figure 32 shows the distribution of bottle glass. Most occurs in the south half of the excavation.

Figure 33 shows the distribution of earthenware and stoneware. Most of these ceramics occur in the south half of the excavation. Figure 34 shows the distribution of porcelain, a high social status item. Ceramics appear to be dispersed throughout the excavation.

Figures 35 to 37 show the distribution of firearm cartridges, cases and bullets. The distribution of .22 caliber, 12 and 10 gauge shotgun cartridges, cases, and bullets are dispersed throughout the excavation while the distribution of center fire, .32 and .25-20 cartridge cases, is limited to the south half of the excavation (Fig. 37). Since cartridge cases are rarely saved and are most often left at the place of their firing, the area of the east excavation appears to have been an ideal location for the shooting of firearms, presumably at targets farther east or south.

The distribution of metal artifacts, bricks, bone, and other cultural remains do not form clusters within the excavation areas. Identification of the bones indicate domestic chicken (*Gallus gallus*), mallard duck (*Anas platyrhynchos*), toad (*Bufo sp.*), domestic dog (*Canis familiaris*), muskrat *Ondatra zibethicus*), raccoon (*Procyon lotor*), and turkey (*Meleagris sp.)* were disposed of at the site. The chicken and raccoon bones have discernible cut or butcher marks, indicating these animals were butchered and probably eaten.

On the basis of the distribution maps, it can be inferred that the larger excavation is located within a refuse dumping area which was at one time the location of some form of wooden structure. Unfortunately, this refuse disposal area appears to have been used for a long period of time. Only a few of the bottles and ceramic artifacts are identifiable as to time and place of manufacture. This reduces the ability to reconstruct economic networks operating in the area during the time of site occupation. The hearth, Feature 1, probably represents a backyard cook-out. The large quantity of cultural remains will allow inferences to be made about the health, economic, and subsistence patterns of some of the peoples who lived in the Donaldson stone house.

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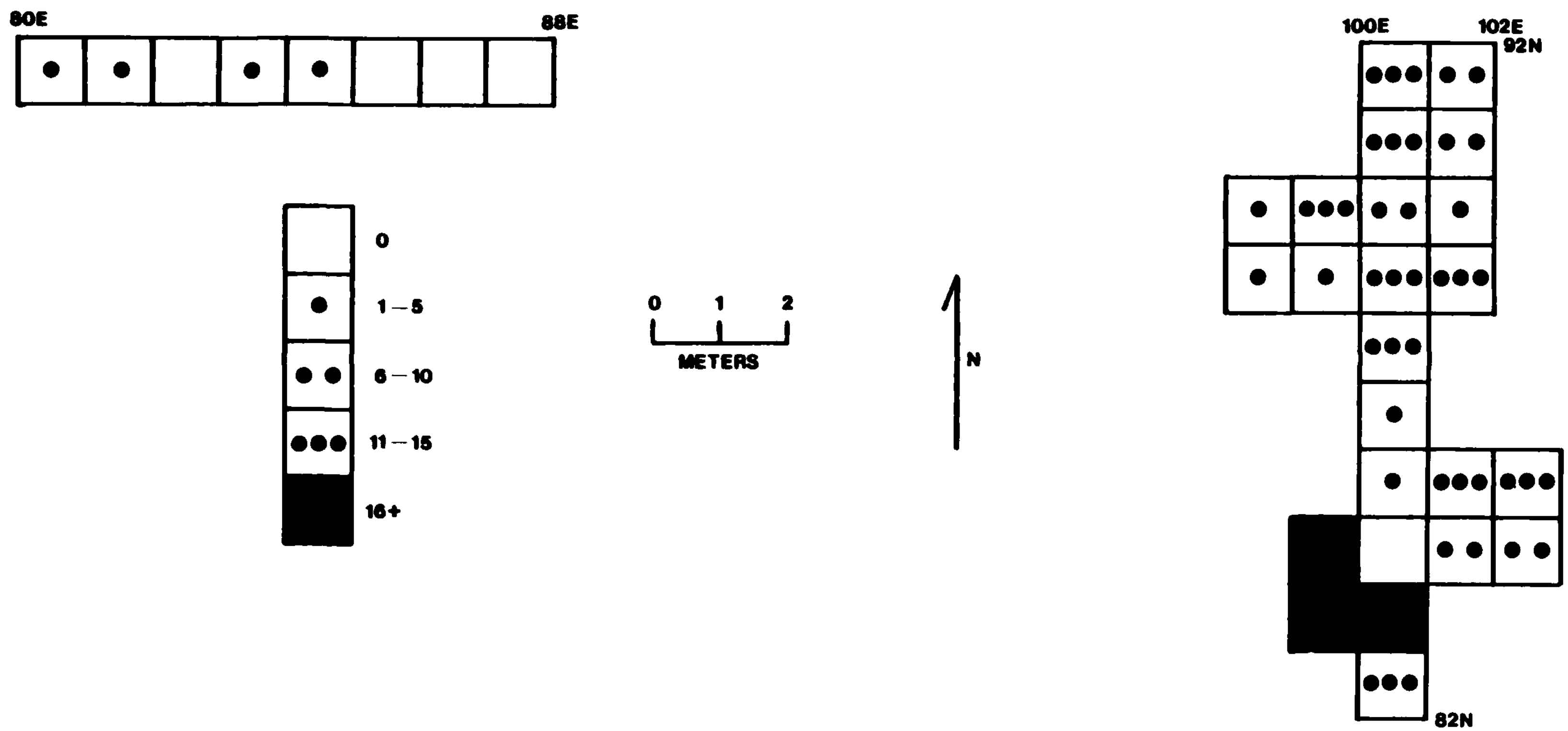

Figure 9.30. Map showing the distribution of wire-cut nails within the test excavations at 14BU1008.

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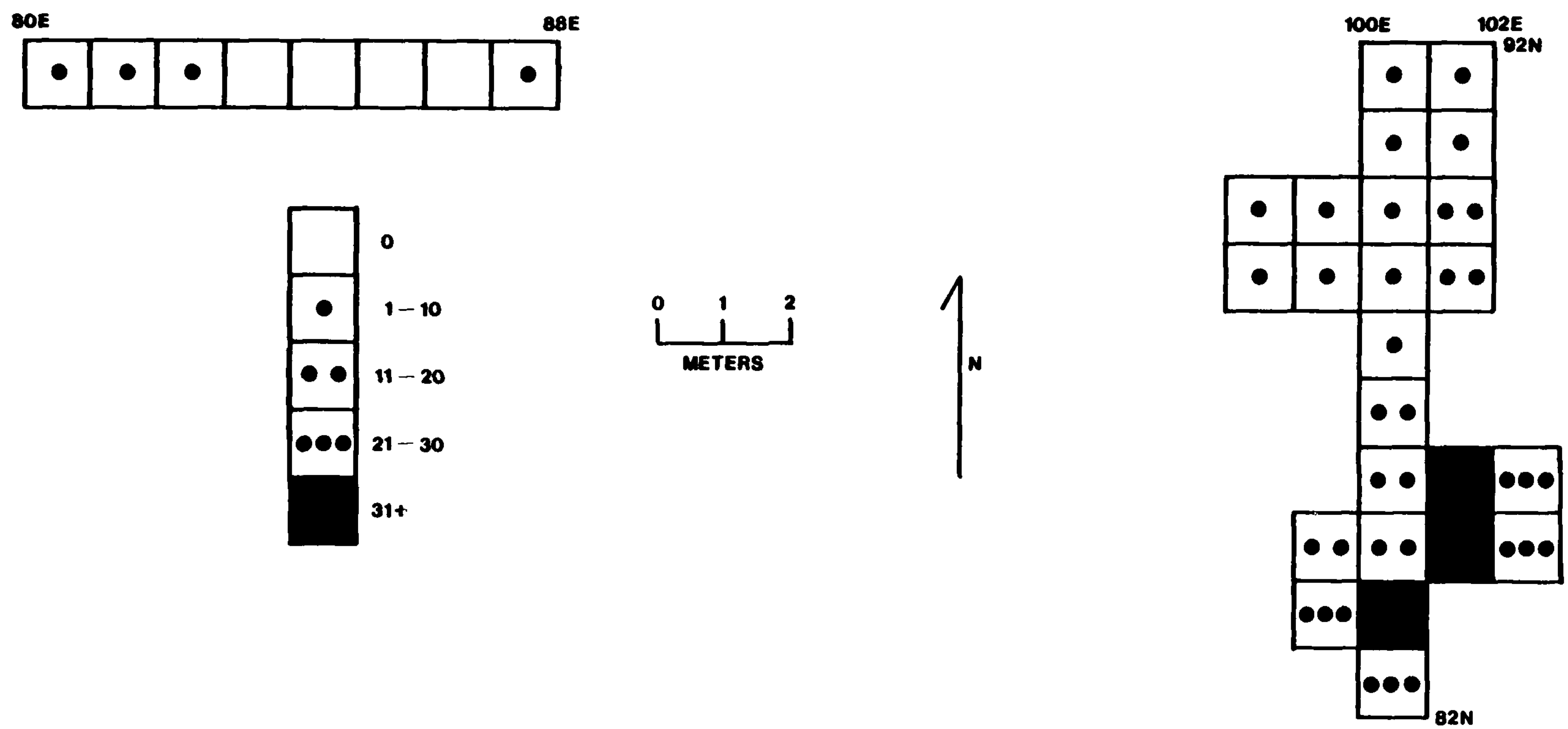


Figure 9. 31. Map showing the distribution of window glass within the test excavations at 14BU1008.

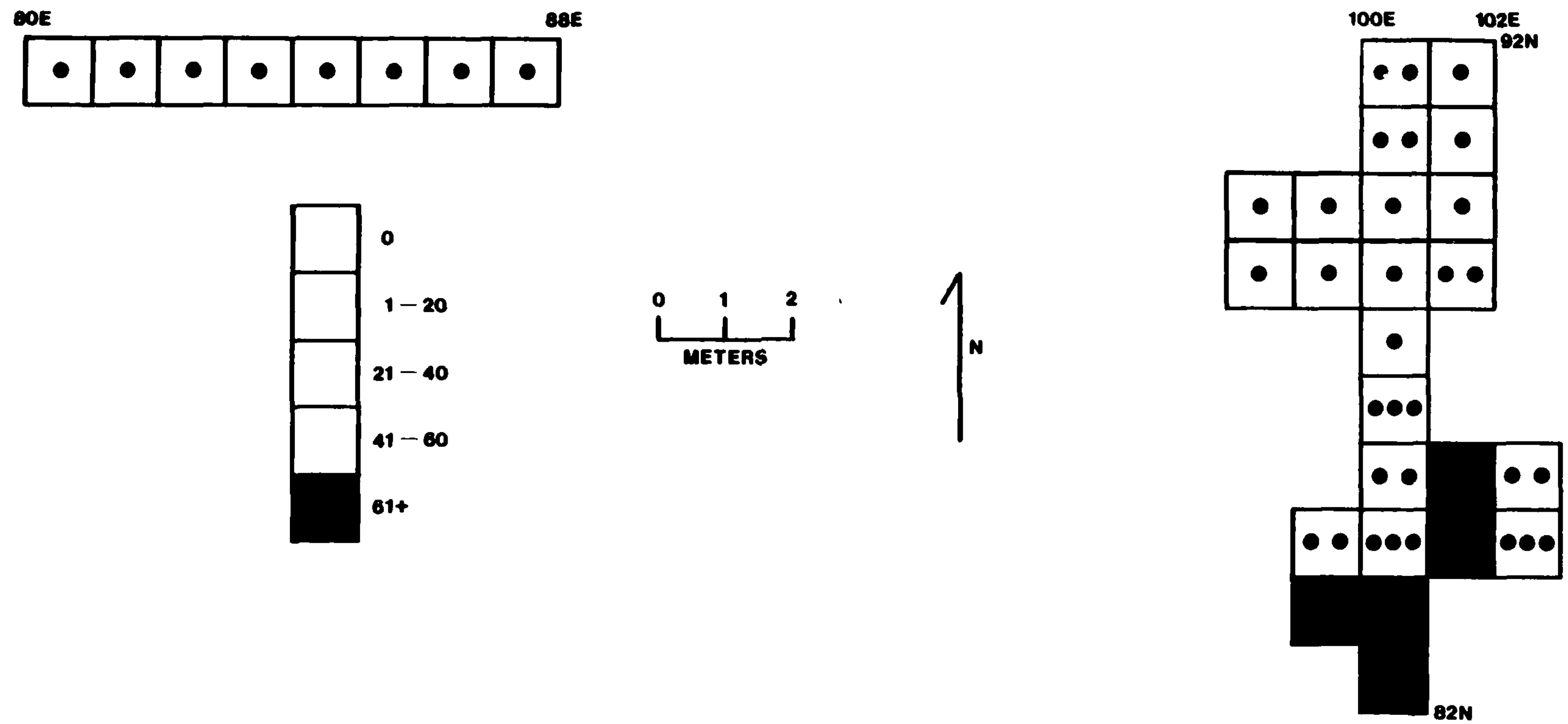
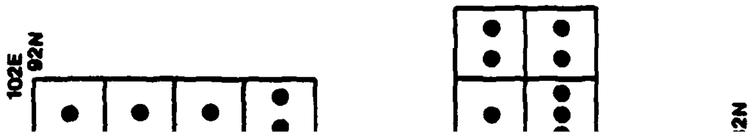


Figure 9.32. Map showing the distribution of bottle glass within the test excavations at 14BU1008.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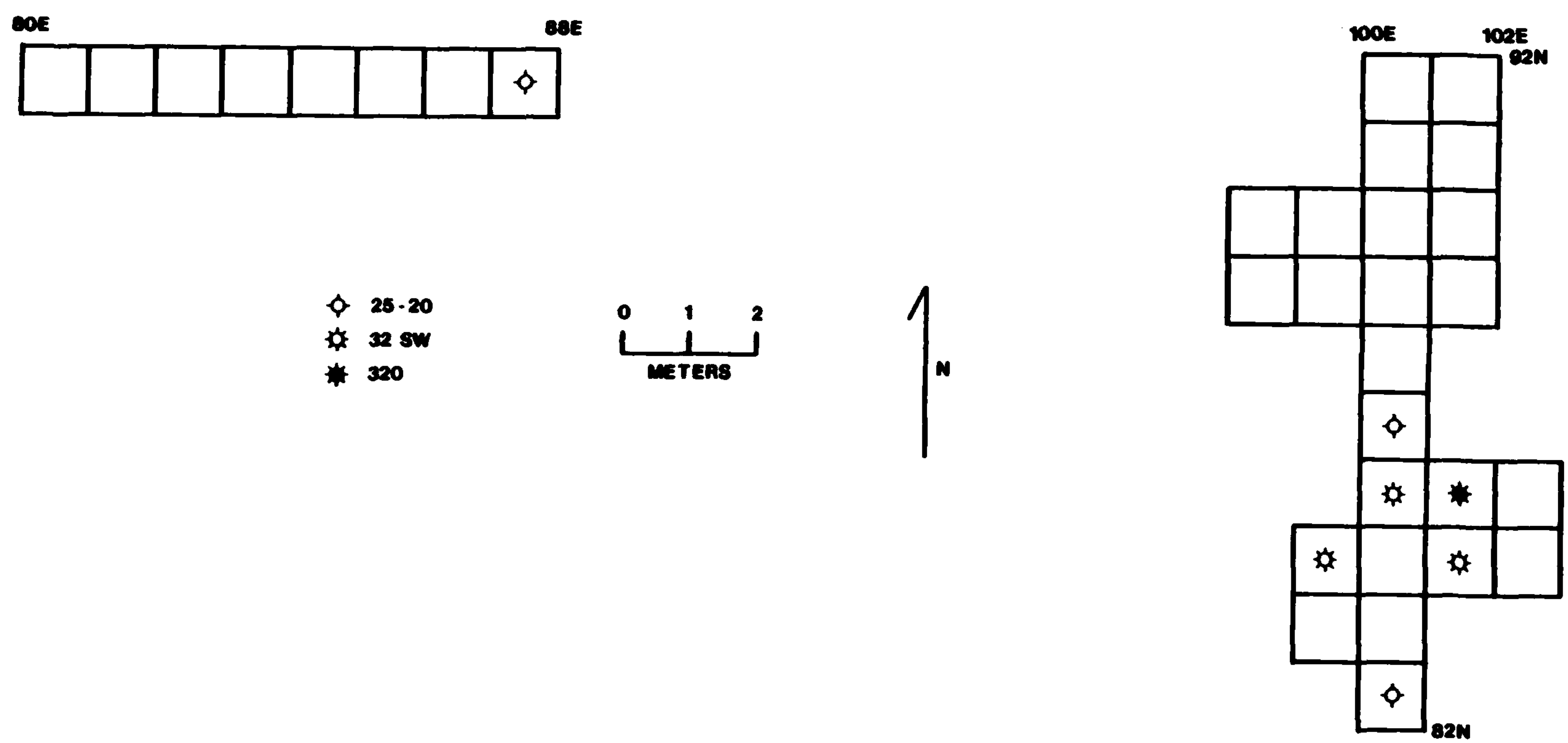

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Artifacts

Surface Collection (n=2)

The Donaldson site was overgrown in grass and weeds, making it impossible to surface collect thoroughly. All surface material was collected from the areas around the test excavations.

One medicine bottle of light manganese and one brass cartridge case were recovered. The cartridge case is a .25-20, center fire, with the U.M.C. headstamp of the Union Metallic Cartridge Company (Logan 1949:189-192.)

Excavated Artifacts

Ceramics

See Anderson, this volume.

Nails (n=340)

This category is further divided into 120 square-cut and 220 wire nails. These two categories are divided according to size.

Square-cut

	1d	2d	3d	4d	6d	7d	8d	9d	10d	16d	20d	indeterminate
quantity	1	2	6	9	10	2	13	4	2	4	2	65

Wire

	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d	12d	16d	20d	indeterminate
quantity	1	6	30	21	13	19	7	41	3	9	5	8	4	53

Staples (n=26)

These specimens are all wire staples probably used in nearby fence construction.

Tacks (n=8)

This category includes one square-cut tack and seven wire tacks.

Roofing Nails (n=2)

These flat headed nails would have been used in attaching roofing to buildings.

Tools (n=6)

Included in this category are: one fragmentary iron, hair curling rod measuring 137 mm. long, 38.6 mm. wide and 10.0 mm. thick (Fig. 46e); one fragmentary end of a box-end wrench with a square opening 7.3 mm. across

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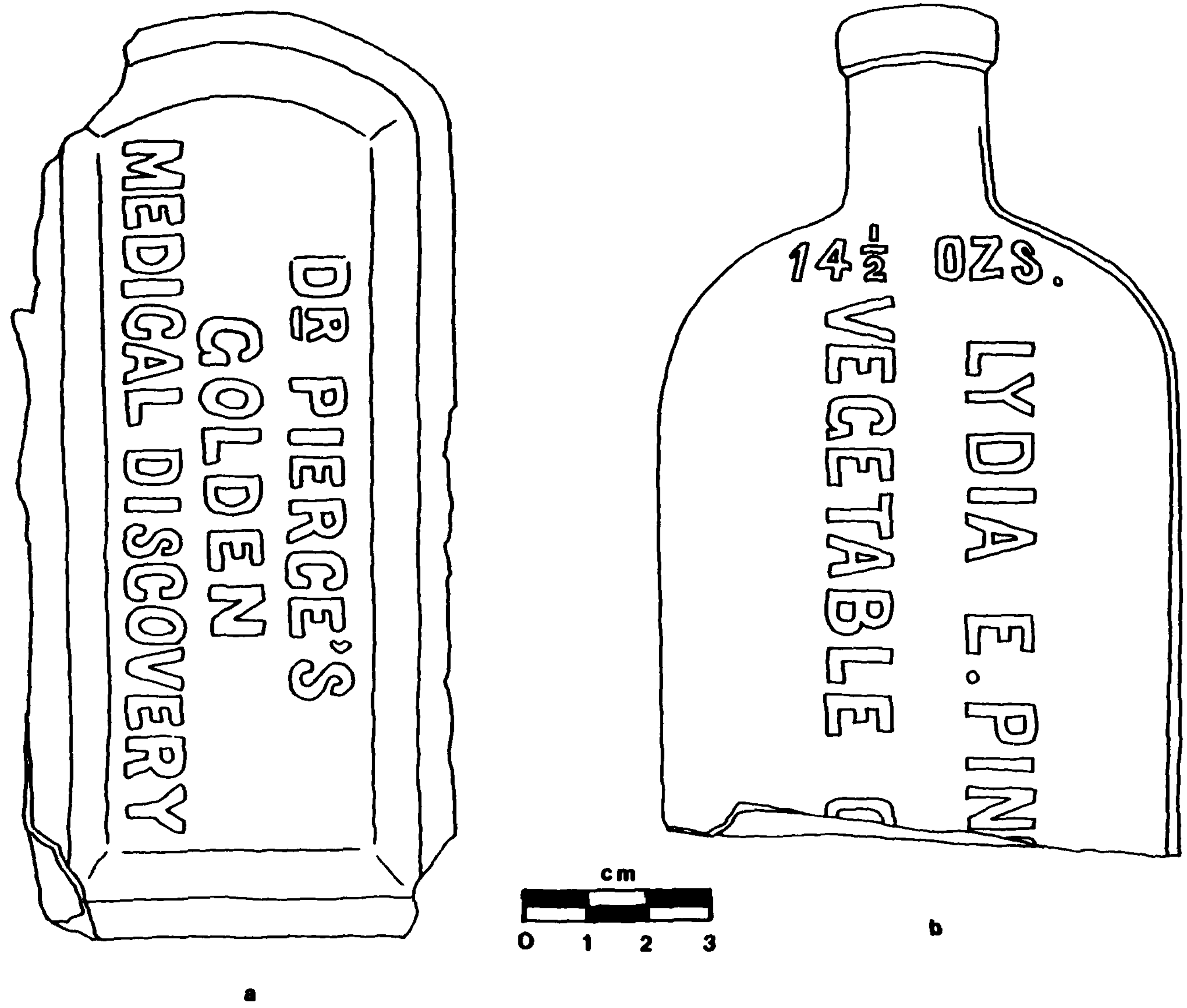

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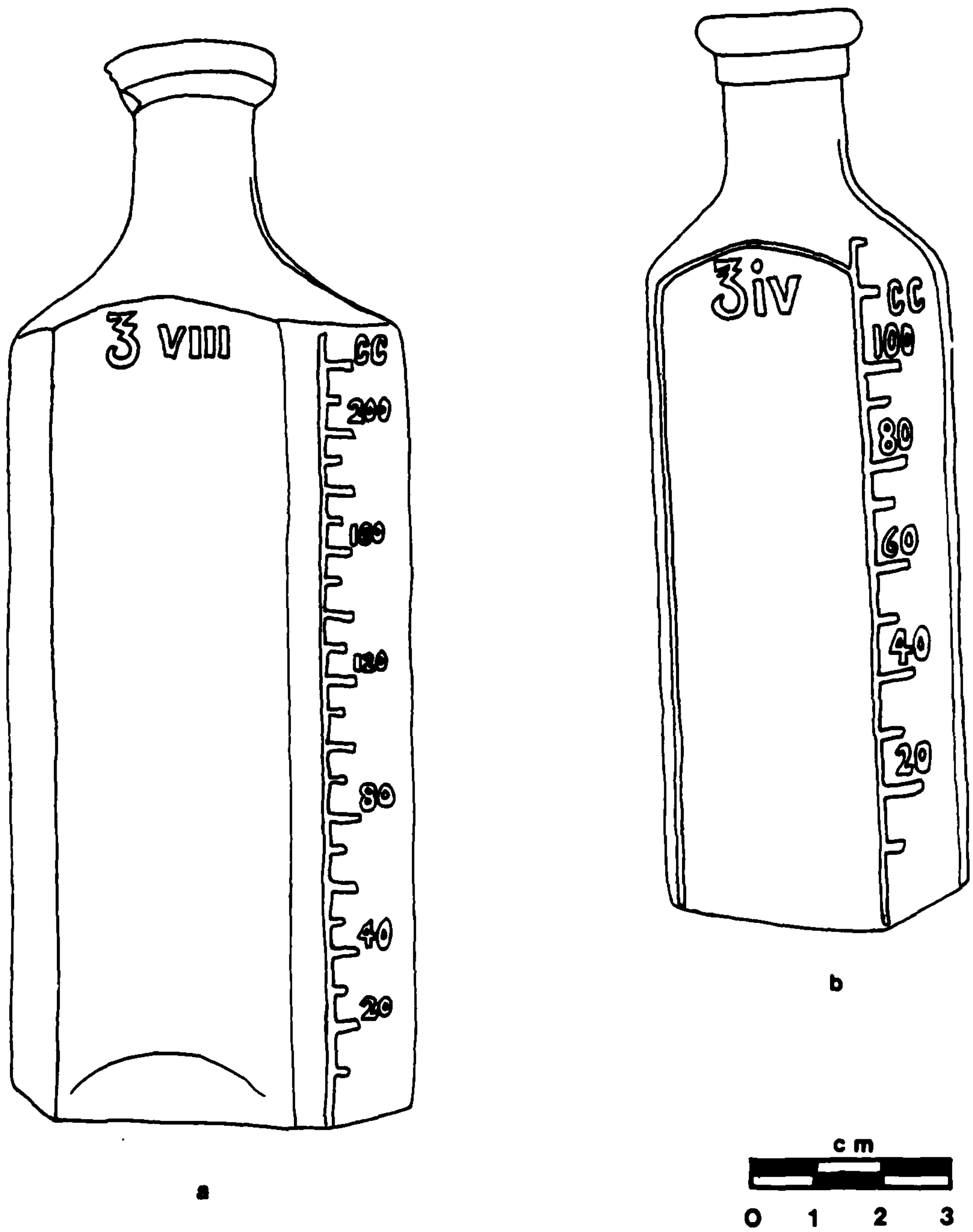

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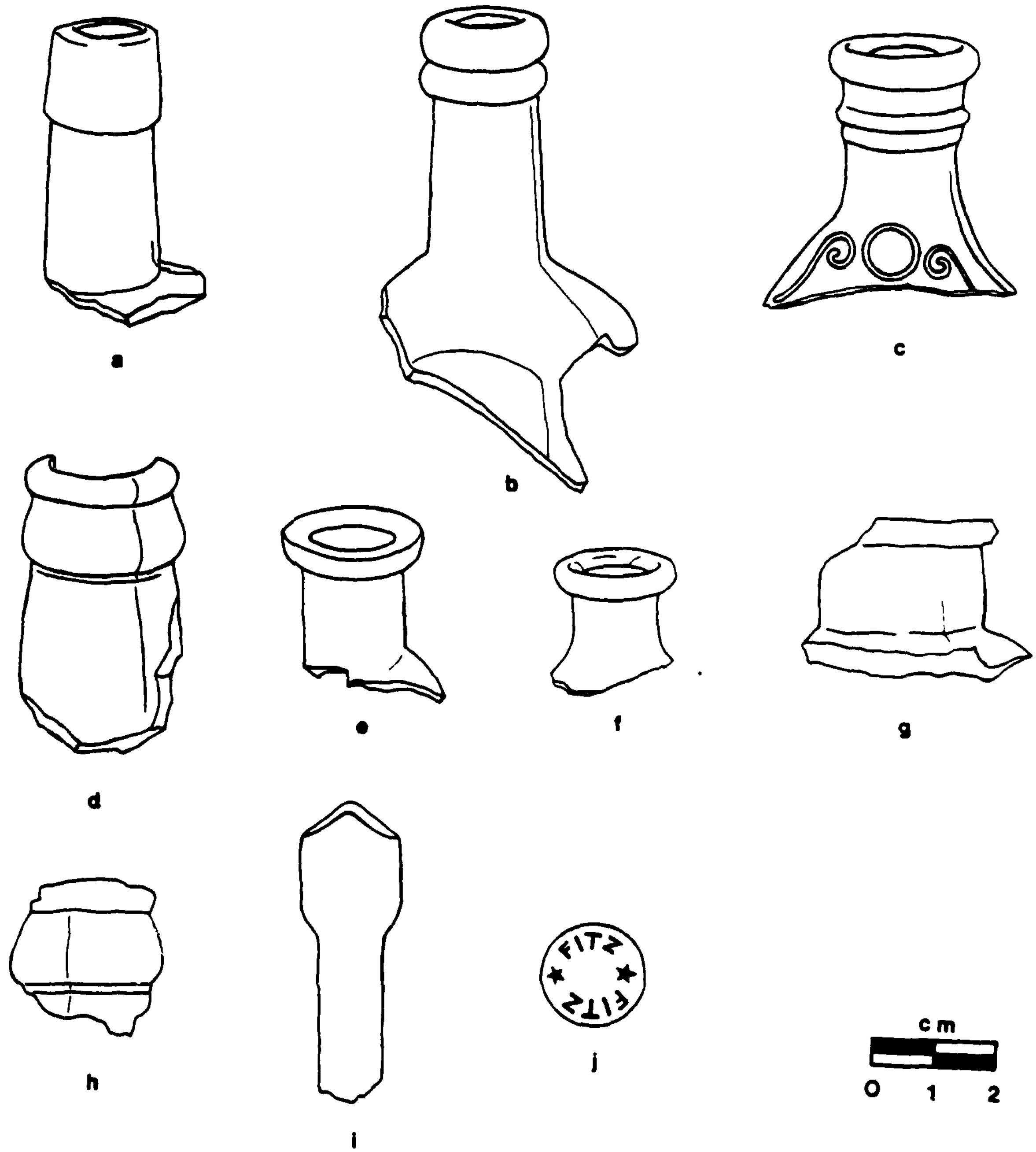

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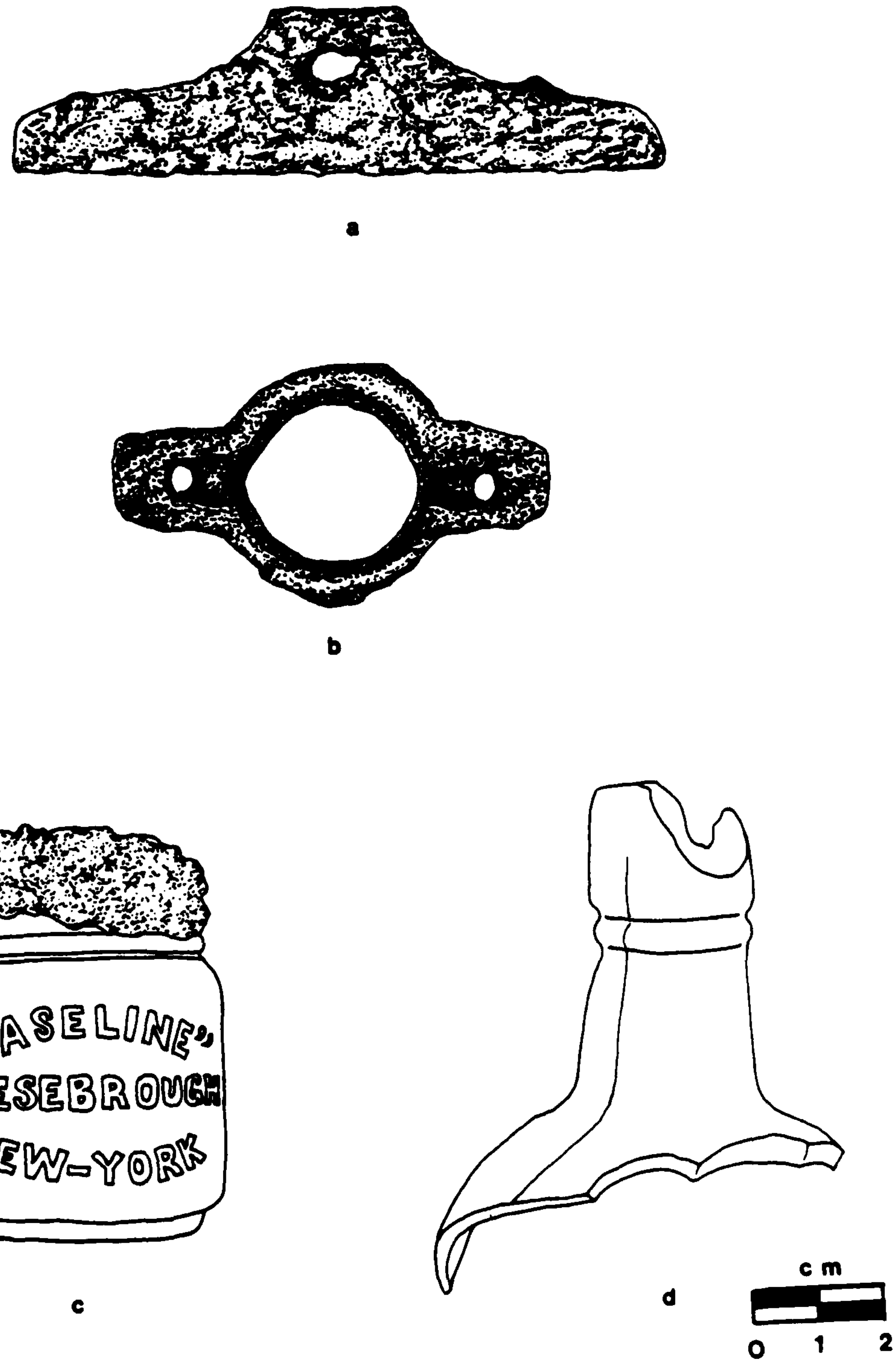

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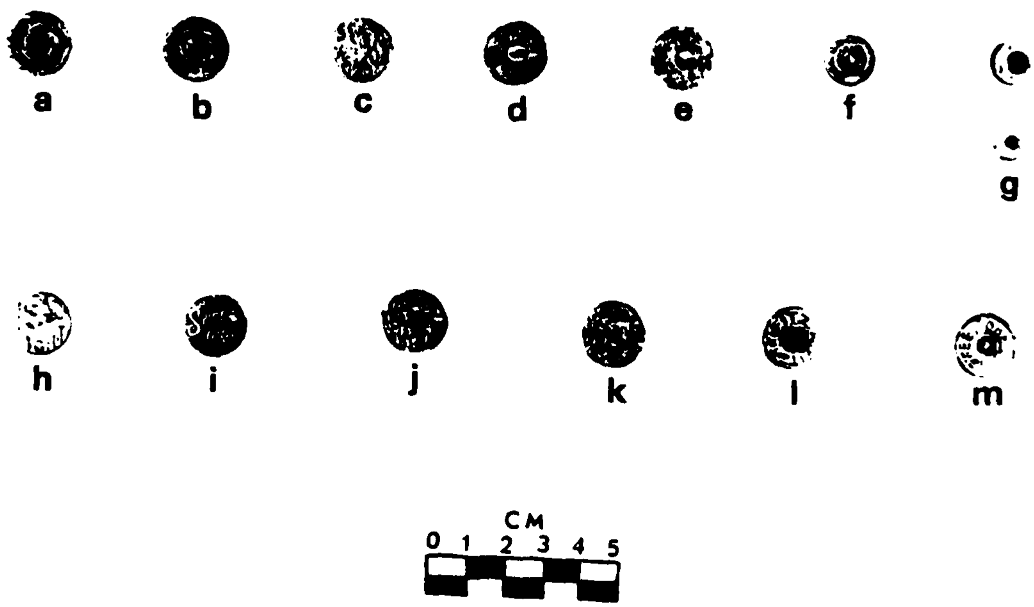

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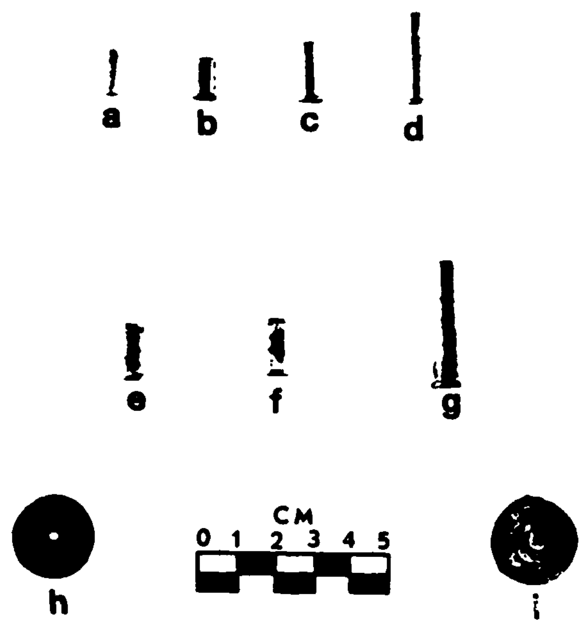

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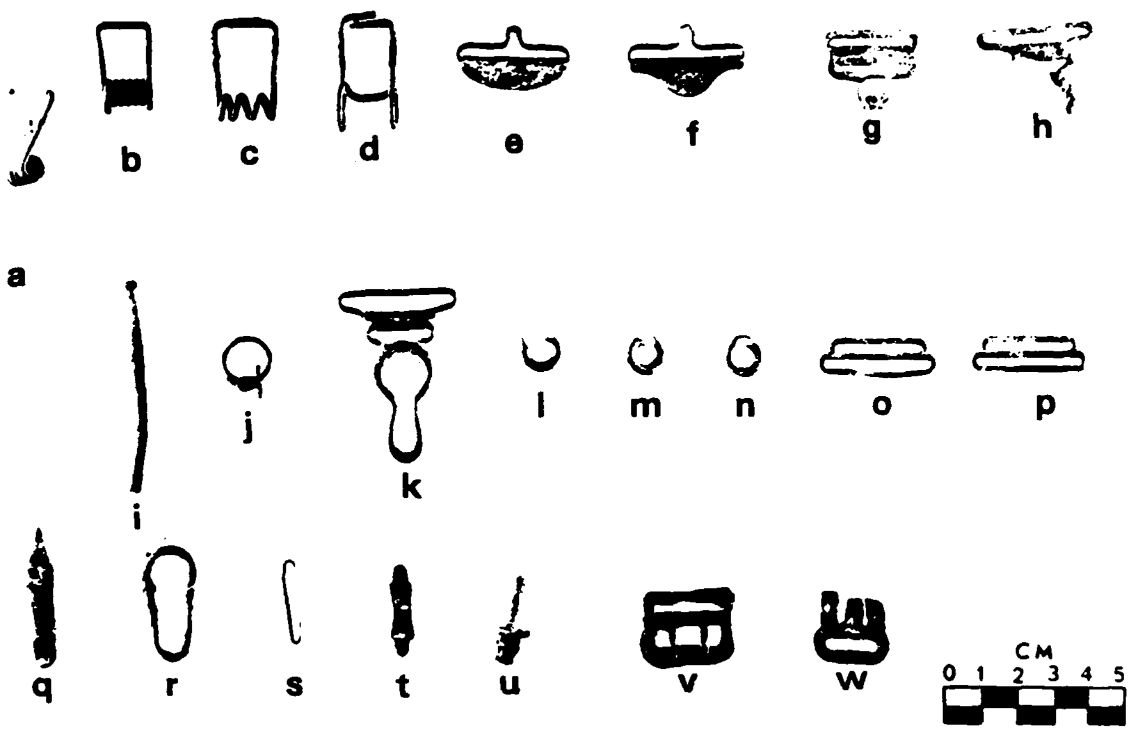

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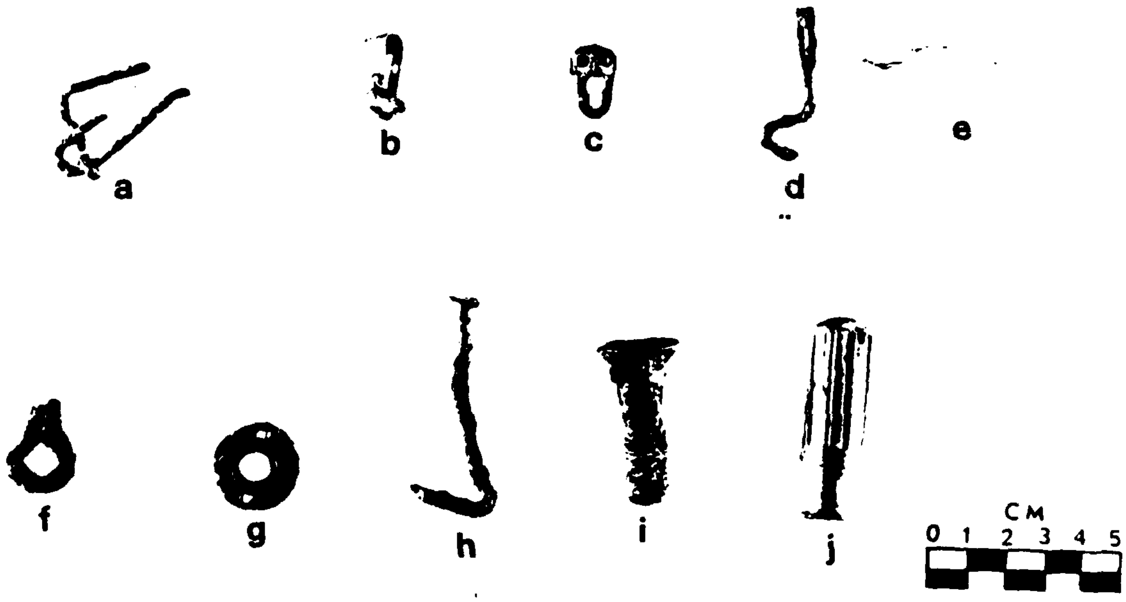

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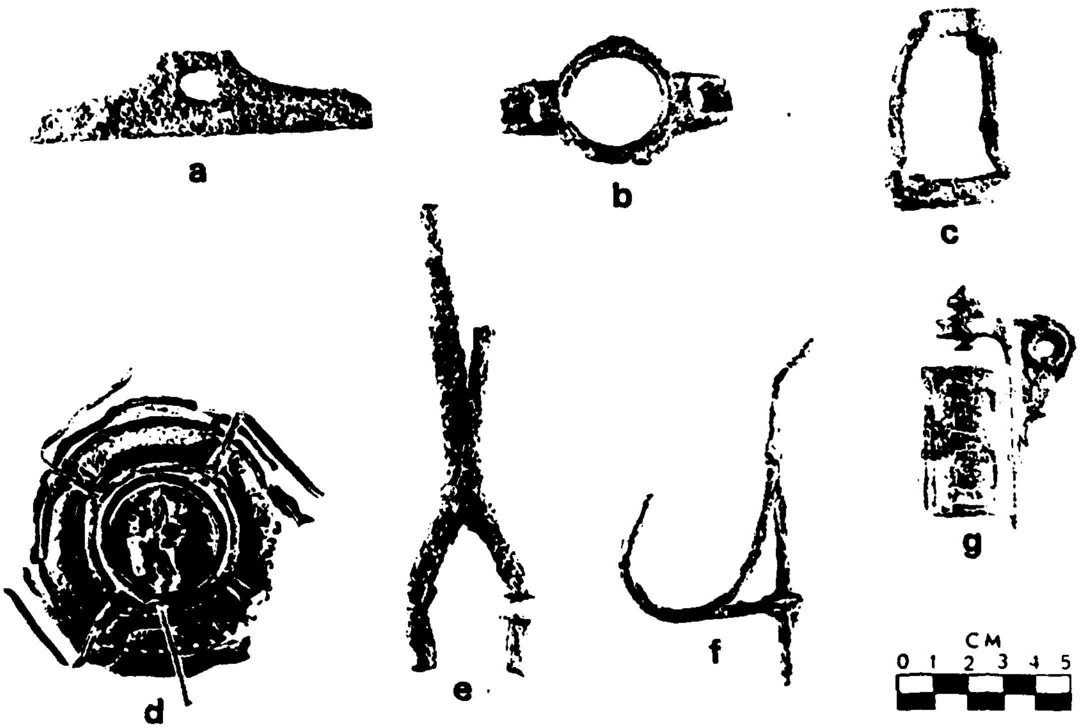

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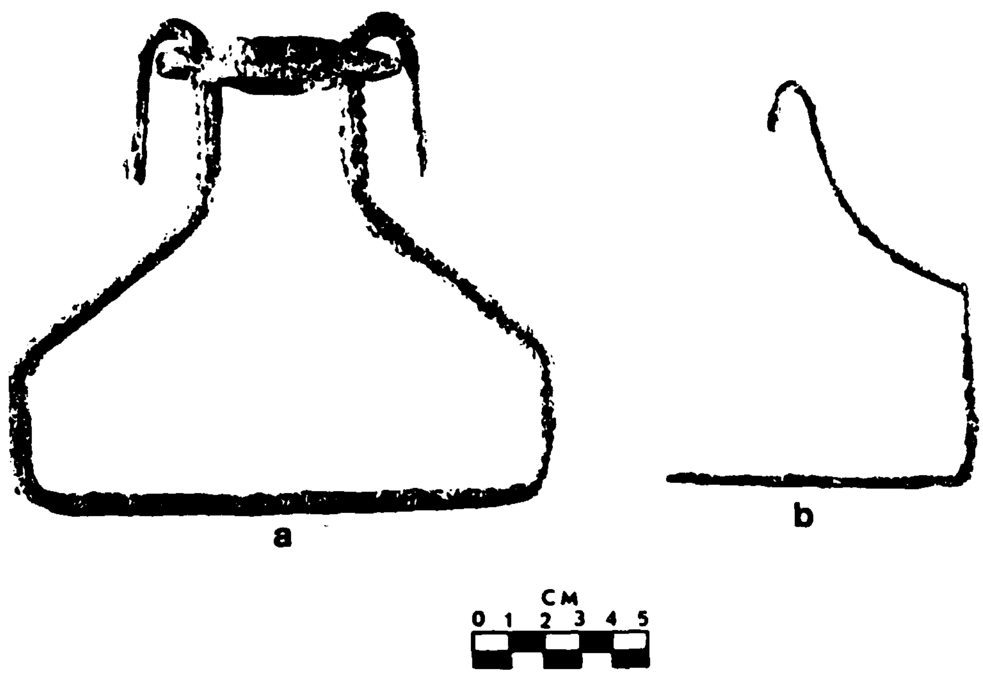

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(Fig. 45f); one fragmentary iron engine crank measuring 415.0 mm. long with a round shaft 19.1 mm. in diameter; one complete, chrome plated iron, screw-on lever handle measuring 52.8 mm. long and 16.7 mm. in diameter (Fig. 45j); one fragmentary, L-shaped, cylindrical wagon handle measuring 142.0 mm. long and 13.3 mm. in diameter; and one iron, flat, square-nosed shovel blade measuring 282.2 mm. long, 237.1 mm. wide and having a socket for a wooden handle.

Stove Parts (n=1)

One fragmentary, cast iron, stove door with the raised letters UKEE / C / WIS is probably from a wood burning stove made in Milwaukee, Wisconsin (Fig. 48).

Firearm Cartridges, Cases and Bullets (n=50)

Included in this category are 35, .22 caliber rim fire cartridges, cases or bullets. Of these, 10 are .22 Winchester Rimfire (WRF) cartridge cases, measuring .960 inch long. This cartridge was introduced for the Winchester Model 1890 pump or slide-action rifle. The .22 WRF was chambered in various Remington, Stevens, and Winchester single shot, repeating rifles and Colt revolvers. It is still loaded by all major ammunition manufacturers, but no one makes rifles for it (Barnes 1965:275). Seven of the cartridge cases have the recessed H headstamp of the Winchester Repeating Arms Co. Two have the U headstamp of the Union Metallic Cartridge Co., and one has the recessed P headstamp of the Peter's Cartridge Co. (Logan 1948:189-192). All have been fired (Fig. 43a, 43b).

Ten .22 caliber cartridge cases are either long or long rifle, measuring .595 inch long. The .22 caliber long was introduced in about 1871 while the long rifle was introduced in 1887. The long rifle was introduced by the J. Stevens Arms and Tool Co. The original case was not crimped, a feature that did not appear until approximately 1900 (Barnes 1965:274). Three cases have the recessed H headstamp of the Winchester Repeating Arms Co. Four cases have the recessed U headstamp of the Union Metallic Cartridge Co. One case has the recessed SUPER X headstamp of the Western Cartridge Co. and one has the cross headstamp (Logan 1948:189-192). All have been fired (Fig. 43c).

Eleven .22 caliber cases are shorts. The .22 caliber short is the oldest American commercial metallic cartridge (Barnes 1965:273). It was introduced in 1857 for the Smith and Wesson First Model Revolver. Three .22 caliber shorts have the recessed H of the Winchester Repeating Arms Co., two have the recessed u headstamp of the Union Metallic Cartridge Co., one has the US headstamp of the United States Cartridge Co., one has the diamond headstamp of the Western Cartridge Co., one has the HP headstamp of the Federal Rimfire Cartridge Co., two have the recessed P headstamp of the Peter's Arms Co., and one has no headstamp (Logan 1948:189-192). All have been fired.

Three .22 caliber lead bullets were recovered. One has been flattened by hitting a solid object. Two still retain their conical shapes. The bullets appear to be from .22 caliber long or long rifles.

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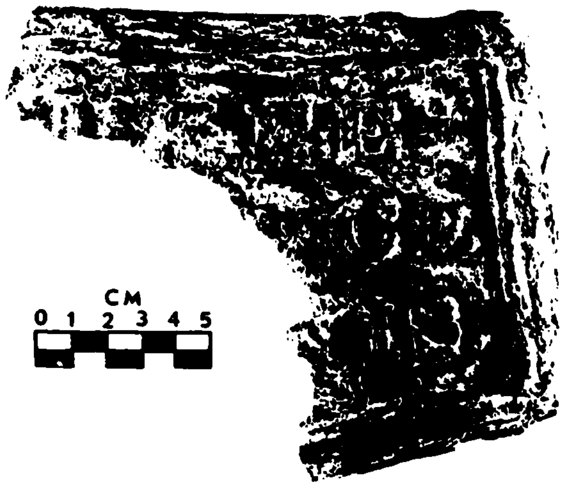

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Three .25-20 WCF center fire cartridge cases were recovered. The .25-20 cartridge was introduced in 1882 for a single shot rifle and was first commercially loaded by Remington (UMC). Winchester Arms Co. designed the .25-20 WCF or repeater version for their Model 92 in 1893 or 1895. This was a shorter cartridge with a bottle-necked case. The .25-20 WCF cartridge is still available (Barnes 1965:74). Of the three .25-20 cases, two have the impressed W.R.A. Co., WCF headstamp of the Winchester Repeating Arms Co. and one has the U.M.C. headstamp of the Union Metallic Cartridge Co. (Logan 1948:189-192). All have been fired (Fig. 43g).

One fragmentary, unfired, center fire cartridge measuring 7.7 mm. in diameter was recovered. It is too fragmentary to determine caliber and make.

One 10 gauge shotgun brass base, with a paper case, was recovered. It has been fired and has the impressed W.R.A. Co., RIVAL headstamp of the Winchester Repeating Arms Co. (Logan 1948:189-192) (Fig. 43i).

Eight 12 gauge shotgun brass bases, with paper cases, were recovered. All have been fired. Three bases have the U.M.C. Co. NEW CLUB headstamp of the Union Metallic Cartridge Co. Two bases have the impressed WESTERN FIELD headstamp of the Western Cartridge Co., one has the impressed WINCHESTER NUBLACK headstamp and another the NEW RIVAL 1901 headstamp of the Winchester Repeating Arms Co. The last base has the impressed POINTER M.F.A. Co. headstamp of the Meriden Firearms Mfg. Co., Meriden, Connecticut (Logan 1948: 189-192) (Fig. 43h).

Wood Screws (n=4)

Included in this category are four, iron, wood screws. Two have flat heads, one has a convex head and the last is indeterminate. The complete screws vary in length from 23.1 mm. to 47.3 mm. and 6.5 mm. to 7.9 mm. in diameter.

Writing Pen Tip (n=1)

Included in this category is one brass, quill pen head, size number 1, with the RESTERBROOK & Co. COLORADO label (Fig. 44q).

Washers (n=5)

Included in this category are five iron bolt washers. They vary in diameter from 16.3 mm. to 38.8 mm. and center holes vary from 4.3 mm. to 12.6 mm.

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Buckles (n=3)

Included in this category are three iron buckles, two fragmentary, one complete. The complete buckle measures 18.3 mm. long, 26.2 mm. wide and 3.6 mm. thick (Fig. 44v, 44w).

Bolts and Nuts (n=6)

Included in this category are two round, flat headed bolts which were probably used to attach plow-shares. One measures 42.6 mm. long, 11.4 mm. in diameter and the other 73.6 mm. long and 11.9 mm. in diameter (Fig. 45i). One round, convex headed bolt, measuring 316.1 mm. long and 8.6 mm. in diameter, may also have been used on farm machinery. Two bolts, with round, convex heads, and with notches for straight screw drivers, were recovered. One measures 17.7 mm. long and 6.8 mm. in diameter and the other 19.6 mm. long and 6.8 mm. in diameter. One complete, chrome plated iron, hexagonal nut with a 4.3 mm. diameter hole was also recovered.

Horse Shoes (n=2)

Two complete horse shoes are included in this category. One shoe has six nails still attached to it.

Mop Frames (n=2)

Two iron-wire mop head frames are included in this category. One is complete, measuring 160.0 mm. wide (Fig. 47).

Clothes Pins (n=9)

Eight clothes pin springs, of which four are of ungalvanized steel and four of galvanized steel, were recovered (Fig. 44b, 44c, 44d). One partially complete clothes pin, made of translucent yellow plastic and a galvanized spring, was also recovered (Fig. 44a).

Wire

This category is divided into plain wire (99.2 grams) and barbed wire (41.6 grams). All pieces are small fragments which are poorly preserved. The barbed wire would have been used in fence construction.

Iron Metal

Included in this category are all small, unidentifiable fragments (578.7 grams) of iron which are poorly preserved (Fig. 45a).

Buttons (n=21)

Included in this category are five, one-piece iron, flat-top, round buttons with back attachments. They vary in diameter from 15.2 mm. to 17.8 mm., with no identification marks (Fig. 42a, 42c).

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Four buttons are one-piece iron with flat tops and two center holes for attachment. They vary from 17.2 mm. to 19.4 mm. in diameter (Fig. 42d). Identification marks are absent.

One fragmentary, one-piece, flat top, iron button has a single center hole for attachment. It measures 14.3 mm. in diameter (Fig. 42e).

Twelve buttons are two-piece consisting of brass-clad iron. Three of these have flat tops, attach from the back and have no identification marks. They have diameters varying between 13.9 mm. to 17.5 mm. (Fig. 42b, 42f).

One fragmentary, flat top, two-piece button has the raised letters "COWDEN" on a stipled background. It measures 17.8 mm. in diameter (Fig. 42k). Two flat top, two-piece buttons have the raised letters "HEAD LIGHT" and measure 17.0 mm. in diameter (Fig. 42h). Two flat top buttons, measuring 16.8 mm. and 17.5 mm. in diameter, have the raised letters "SWEET-ORR & Co." (Fig. 42i; 42m).

One fragmentary, two-piece, flat top button has the raised label "MOGUL" on a stipled background and measures 17.0 mm. in diameter (Fig. 42j). Another two-piece button has a slightly convex top and the raised label "FITZ" (Fig. 42l, 40j).

One, two-piece button, measuring 16.0 mm. in diameter, has a 6.6 mm. square center hole for attachment. It lacks an identification label. Also recovered was one, two-piece, brass snap-type button measuring 12.4 mm. in diameter. It also lacks an identification label (Fig. 42g).

Garter and Suspender Strap Fasteners (n=12)

Included in this category are five fragmentary iron fasteners (Fig. 44h), five complete copper fasteners and two incomplete copper fasteners. They vary in width from 26.1 mm. to 32.7 mm. (Fig. 44e, 44f, 44g, 44k, 44o, 44p).

Safety Pins (n=4)

Included in this category are two fragmentary brass pins and one chrome plated steel end of a pin. One complete, old style, brass pin was also recovered (Fig. 44s).

Eyelets (n=3)

Three brass eyelets, probably from shoes, have orifices of 6.2 mm. and outside diameters of 11.6 mm. (Fig. 44l, 44m, 44n).

Bottle and Can Lids (n=8)

Four crown cap type bottle caps measuring 30.0 mm. to 30.8 mm. in diameter were recovered. These were probably used on soft drink bottles. Two round, press-in can lids measuring 47.5 mm. and 50.0 mm. in diameter were probably used for storage of household goods. Two fragmentary

screw-on iron bottle caps, measuring 31.9 mm. in diameter, were probably used for medicine or storage bottles.

Spoons (n=1)

Included in this category is the distal end of a baby spoon. The spoon is made of aluminum (Fig. 45e).

Miscellaneous Metal Artifacts (n=42)

Included in this category are: one unidentifiable iron pin which has one round end with a small eyelet and measures 59.5 mm. long and 3.3 mm. in diameter (Fig. 44i); one fragmentary, iron hair pin with a black, glass ball head; one fragmentary, unidentifiable, circular iron artifact with a hole 7.1 mm. in diameter and an outside diameter of 23.0 mm. (Fig. 45g); one complete, unidentifiable, iron ring with a press-clip for attachment to a shirt pocket (Fig. 44j); one large, fragmentary, cylindrical, L-shaped, iron bar, weighing 3,422 grams and having a diameter of 36.2 mm.; one complete, unidentifiable, iron artifact which measures 68.0 mm. long, 37.0 mm. wide and 11.4 mm. thick and has a 25.2 mm. diameter hole in the center and a single thread inside the large center hole for attachment (Fig. 41b, Fig. 46b); one unidentifiable, iron plate, measuring 101.0 mm. long, 25.2 mm. wide and 4.6 mm. thick and having a beveled edge with a center hole 10.3 mm. in diameter (Fig. 41a, Fig. 46a); one size 12d wire nail which has been bent into an L-shape to form a hook and was probably used as a latch on a door (Fig. 45h); one fragmentary, iron, can opening key for cans with tab-tops (Fig. 45d); one complete, iron harness strap link which measures 58.1 mm. long, 38.9 mm. wide and 10.00 mm. thick (Fig. 46c); one fragmentary, iron rivet measuring 39.6 mm. long and 6.5 mm. in diameter;

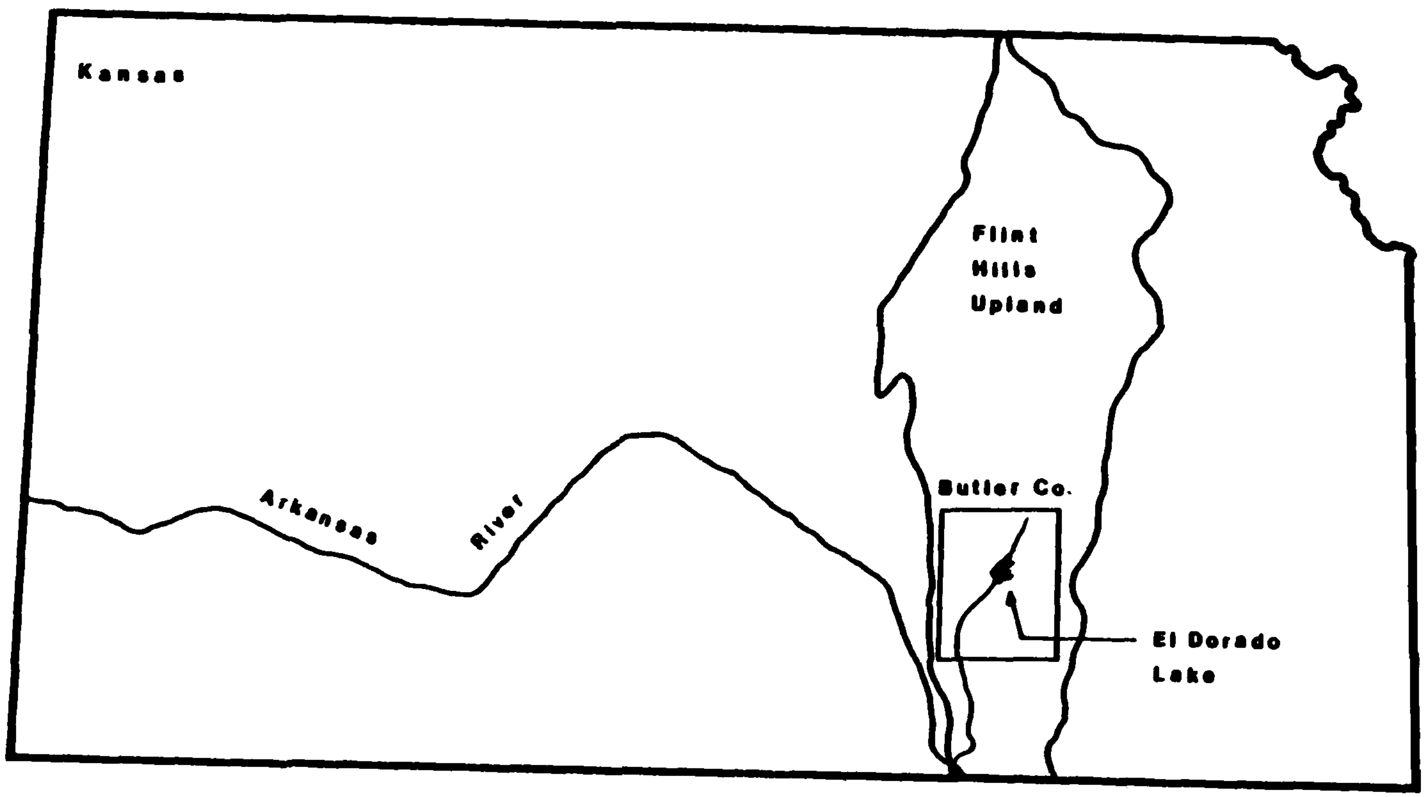

Figure 1.1. The El Dorado Lake project is located along the Walnut River in the northeastern quadrant of Butler County, Kansas.

Tar (n=2)

Included in this category are two globular pieces of black tar, one weighing 7.1 and the other 12.3 grams.

Coal and Coal Slag

Several small pieces (1.1 grams) of coal and slag were recovered from the excavation.

Shell

Numerous fragments of shell (33.4 grams) were recovered from throughout the excavation.

Burned Earth

Several small fragments (5.9 grams) of burned earth were recovered.

Cement

Several fragments of cement mortar (183.0 grams) were recovered.

Charcoal

Several small fragments of charcoal (10.9 grams) were recovered.

Graphite (n=3)

Included in this category are fragmentary, cylindrical, graphite bars. They vary in diameter from 5.1 mm. to 7.7 mm. They are probably from the interior core of dry cell batteries.

Stained Ivory (n=1)

One incomplete piece of brown, stained ivory, with a 4.3 mm. diameter hole bored into the narrow end and discernible saw marks on the wide end, has a lateral snap at the small end. It measures 49.3 mm. long, 17.3 mm. wide and 10.2 mm. thick (Fig. 40i).

Plastic Tools (n=3)

Included in this category are: one black plastic screw-on bottle cap measuring 20.0 mm. in diameter; one fragmentary, green plastic, eating fork; and one green plastic comb tooth measuring 28.1 mm. long.

Plastic

Two types of plastic are included in this category: rigid (11.5 grams) and pliable (1.3 grams). The rigid plastic is probably from toys and household items while the pliable are fragments of black sheet plastic.

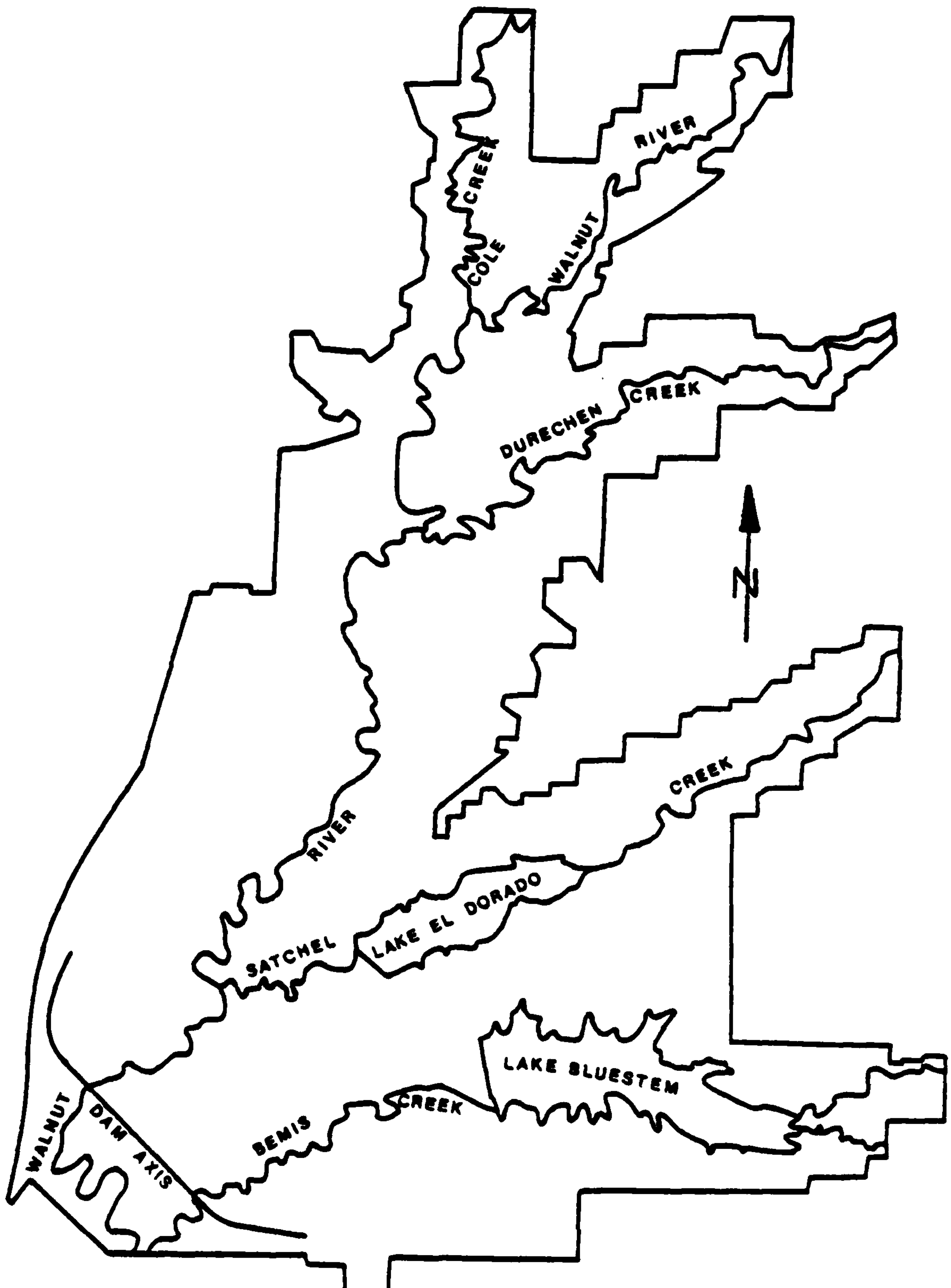

Figure 1.2. The El Dorado Lake project reservation.

Tire Rubber (n=11)

Included in this category are eleven pieces of tire tread. Eight of these fragments show evidence of having been from retreaded tires.

Floor Covering (n=18)

This category includes pieces of blue floor tile, probably from the recently vandalized stone house.

Unworked Stone (5,895.9 grams)

Included in this category are several types of stone: limestone, chert, pumice, and slate. The slate is probably from writing tablets while the chert and limestone are from construction activities. The pumice may have been used in household activities. Most of the unworked stone (5,639.2 grams of limestone) was recovered from Feature 3, the post stain.

Faunal Remains

Several large bones with saw marks, but not identifiable as to species, are probably of cattle and pigs. Included in the bones which were identifiable are: the distal epiphysis of a right tibiotarsus of an immature turkey (*Meleagris sp.*); a distal and fragment of a right humerous of a raccoon (*Procyon lotor*); one complete, left mandible, with an intact M_1, of a muskrat (*Ondatra zibethicus*); one complete right femur of a dog (*Canis familiaris*); a proximal end of a urostyle-axial of a toad (*Bufo sp.*); a distal end of a left humerus and a proximal end of a left carpometacarpus of a mallard duck (*Anas platyrhychos*).

Domestic chicken (*Gallas gallas*) is the best represented animal in the faunal assemblage. The following elements were recovered: one proximal end of a left tibiotarsus; one distal end of a left tibiotarsus; one left acetabulum; one right acetabulum and ilium; one disto-lateral left femur shaft; one proximal end of a left femur; one complete right carpometacarpus; one incomplete left humerus; one fused vertebrae and axial; one proximal end of a left fibula; one proximal end of a left radius; one proximal end of an immature left scapula; and one complete left tarsometatarsus.

Window Glass (n=362)

This category is further divided into four color types: clear (110); aqua (25); green tint (226); and light manganese (1).

Bottle Glass (n=914)

This category is further divided into 12 color types: clear (389); amber (52); green tint (68); dark manganese (15); light manganese (141); aqua (162); milk (65); frosted clear (8); translucent milk (4); sea green (4); cobalt blue (3); and yellow tint (3). Several bottle fragments have characteristic features and are described separately below according to color.

The valleys of the area are deeply filled with alluvium, and surrounding uplands are covered with a relatively thin veneer of regolith, tentatively interpreted to be eolian loess. Streams are deeply incised in alluvium, in most cases to bedrock. It is believed that alluvial degradation on the floodplain has been the rule for approximately the past 1000 years, and that current valley deposits began accumulating over 20,000 years ago. All known buried archeological sites in the area have been found in the alluvium, and only in the upper 2.5 m. (i.e., in the upper 25%). These deepest cultural materials approach 5000 years in age.

The T-0 floodplain (defined as the broad flat surface usually adjacent on both sides of a stream that is ever subject to flooding and alluviation) reaches 1200 m. in width along this part of the Walnut River. Actual terrace scarps are few, and only one major cut and fill terrace (T-1) exists in this part of the valley. It is approximately 8.5-9 m. above the river bed, and it has been correlated with the Norge Soil Series for mapping delineation purposes (see Fig. 1.3). This terrace is considered Pleistocene in age. At least two minor cut terraces have been slightly etched into the Holocene alluvium, probably within the last 1000 years.

A paucity of absolute dates and paleoenvironmental indicators has greatly hampered the reconstruction in the absolute sense. However, the relative sequence of events in the geologic history of the area seems clear, and rough dates may be postulated on logical grounds. Figure 1.4 depicts a generalized cross section of the upper Walnut River Valley as interpreted for the present and recent past (last 1000 years). Figure 1.5 presents the interpreted sequence of events leading up to the Figure 1.4 characterization. The numbers are generally in chronological order from oldest to most recent event.

Beginning with a stripped surface, except for residual coarse stream gravels (Fig. 1.5, A), we see red loess being deposited in the uplands and subsequently washed into the valleys to form red alluvium to a depth of 9-10 m. (Fig. 1.5, B). Then (Fig. 1.5, C) a major (and probably long) period of erosion followed which stripped out much of the red alluvium, left a high red major cut terrace, and cut several channels into the lowered alluvium; these in turn became filled with sediments. Another minor erosional episode trimmed off the tops of the paleochannels and adjacent red alluvium. As the Pleistocene drew to a close, Holocene valley filling began about 11,000 B.P. and continued almost unabated to the present (Fig. 1.5, D). This "upper alluvium" accumulated to a level almost identical to that of the earlier red "lower alluvium." The T-1 terrace was transformed into a cut and fill terrace. A paleosol (Fig. 1.6) with an estimated date of 2000 B.P. indicates a temporary period of stability at that time. Within the past 1000 years (Fig. 1.4), minor cut terraces were notched into high banks, and some floodplain surface erosion occurred. The buildup of the upper alluvium is believed to have been rapid at first, with 75% forming within about 6000 years and the upper 25% within the past 5000 years.

The postulated dating framework is based on: (1) stratigraphic relations, (2) the strong degree of weathering of the red loess which was

Clear

One crenated base or rim fragment with a diameter of 70.0 mm.
One straight rim (type 10) fragment of a drinking glass.
One complete rim of a bottle with a blob top (type 1) and having an orifice of 11.1 mm. The seam extends to the base of the rim making the time of manufacture of the bottle between 1880 and 1900 (Adams 1971) (Fig. 40c).
One fragmentary medicine bottle with a graduated scale in cc. (Fig. 39a).
One fragmentary rim with a screw top and an orifice of 11.9 mm.
One rim fragment with a packer top (type 3) and an orifice of 10.2 mm.
One fragment with the raised letter "B".
One rim fragment of a screw top mason jar with an orifice of 60.0 mm.
One rim fragment has a packer-like top (type 3) and has an orifice of 18.0 mm. The seam extends to the middle of the lip, making manufacture of the bottle between 1860 and 1880 (Adams 1971) (Fig. 41d).
One bottle with an extract top (type 7) has an orifice of 17.0 mm. The bottle has the letters LYDIA E. PIN / VEGETABLE O (Fig. 38b). It has an applied lip and the seam extends half way up the neck, making manufacture of the bottle between 1860 and 1880 (Adams 1971). It is a 14½ ounce size bottle.
One rim fragment with an extract top (type 7) with an orifice of 15.0 mm.
Two round, base fragments, one measuring 80.0 mm. and the other 70.0 mm. in diameter.
One base fragment of a rectangular bottle measuring 32.6 mm. wide. It has a rectangular, shallow kickup.
One glass fragment with the raised letters "MELTO".
One straight rim fragment, probably of a chimney for an oil burning lamp. It measures 60.0 mm. in diameter.
One crenated base fragment of a bowl. It measures 80.0 mm. in diameter.
One rim fragment of a jar with a screw top. The orifice is 70.0 mm.
One straight rim fragment with a small blob lip (type 11) with an orifice of 70.0 mm. (Fig. 40f).
One rim fragment of pressed glass (sunburst design) with a blob lip (type 2) and an orifice of 260.0 mm.
One rim fragment of a bowl or drinking glass with a round lip (type 13).
Two round base fragments, one measures 65.0 mm. and the other 55.0 mm. in diameter. Kickups are absent on both bases.
One, round, crenated rim fragment.
Two, straight, rim fragments (type 10) to bowls or drinking glasses.
One rim fragment to a threaded mason jar with an orifice of 55.0 mm.
One glass fragment with the raised letters "E. WIS.".
One rim fragment of pressed glass.
One round, base fragment with a slight kickup.
One medicine bottle fragment with graduations in ounces on the left and cc. on the right. Identification marks are absent (Fig. 39b).

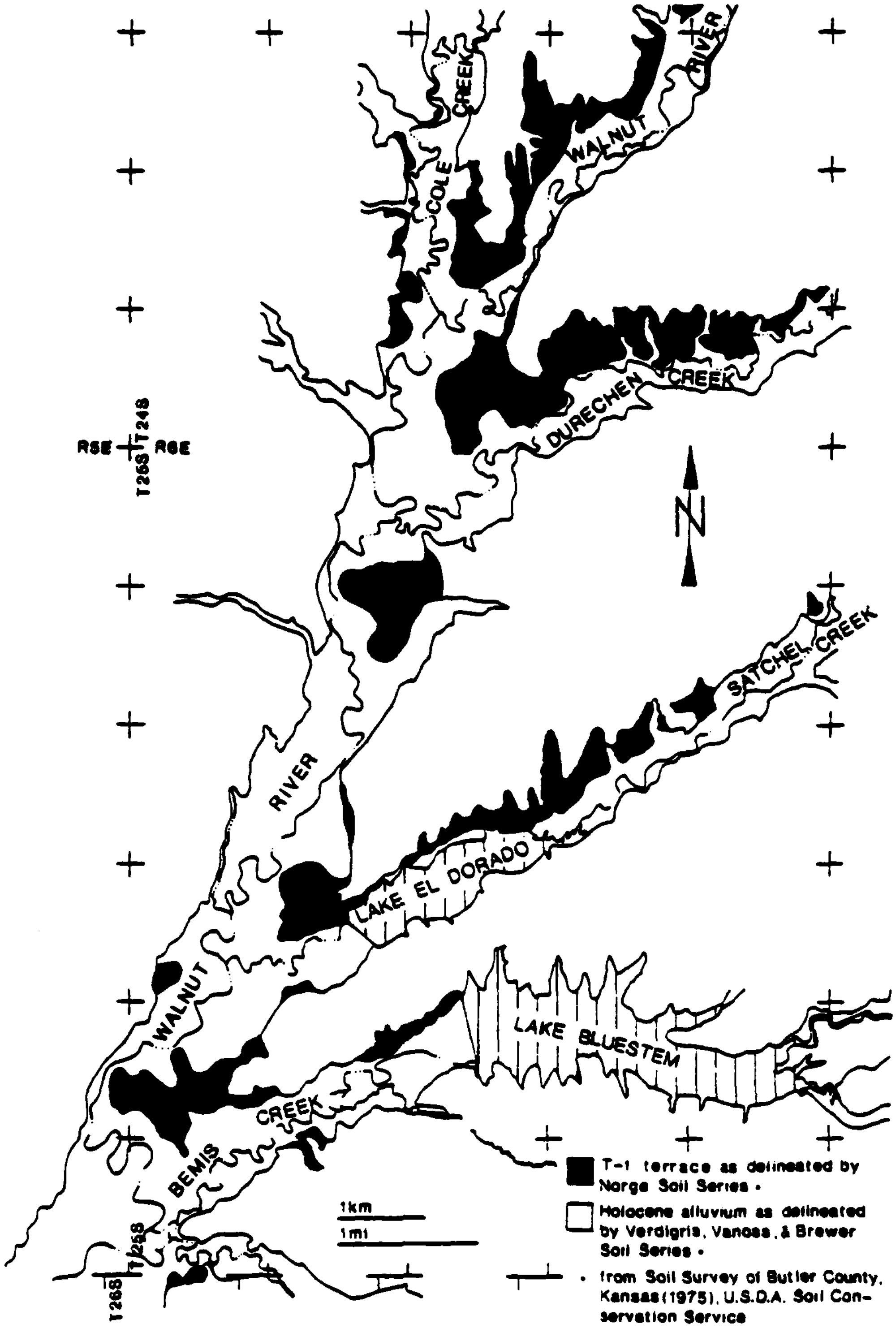

Figure 1.3. Red terrace (T-1) remnants and Holocene alluvium as mapped by soil types, El Dorado Lake Project.

One pouring spout with rolled edges. It measures 17.1 mm. long and 15.6 mm. wide.

One rim fragment with an outflaring lip (type 5) and an orifice of 10.0 mm.

One medicine bottle fragment with a graduated scale on the right side.

Green Tint

Two rim fragments of a bowl with a straight rim (type 10) and an orifice of 100.0 mm.

One rim fragment with a type 14 rim. The seam extends the full length of the neck making the manufacture of the bottle after 1903 (Adams 1971) (Fig. 40d). The orifice is 15.7 mm. This is probably a soft drink bottle.

One nearly complete, rectangular medicine bottle, with the raised letters "DR. PIERCE'S GOLDEN MEDICAL DISCOVERY" on the front and "R.V. PIERCE, M.D." on the side (Fig. 38a). The bottle measures 8 3/4 x 1 5/8 x 3 inches. An 1872 advertisement in the Ithaca Journal (N.Y.) states two to six bottles were warranted to cure salt rheum or tetter, etc. Six to twelve bottles for scrofulous swelling and sores, pains in bones, etc. It was manufactured in Buffalo, New York by R.V. PIERCE, M.D., World's Dispensary (Baldwin 1973:387-88). This bottle probably dates between 1870 and 1900.

One complete rim of a rectangular bottle has an orifice of 9.0 mm. and a blob top (type 1). The seam extends to the base of the rim making manufacture of the bottle between 1880 and 1900 (Adams 1971) (Fig. 40b).

Dark Manganese

One, straight rim of a glass or bowl (type 10 rim).

Amber

One fragmentary bottle with the raised letters B EGG S / -DEL- . This is a patent medicine bottle manufactured and sold by Begg's and dates between 1885 and 1900 (Baldwin 1973:61).

Cobalt Blue

One base fragment of a round jar or bottle measuring 50.0 mm. in diameter.

Light Manganese

One crenated lip fragment with an indeterminate orifice diameter.

One complete rim with an orifice of 8.7 mm. and a type 5 rim. The seam extends to the base of the neck making the manufacture of the bottle probably between 1860 to 1880 (Adams 1971) (Fig. 40e).

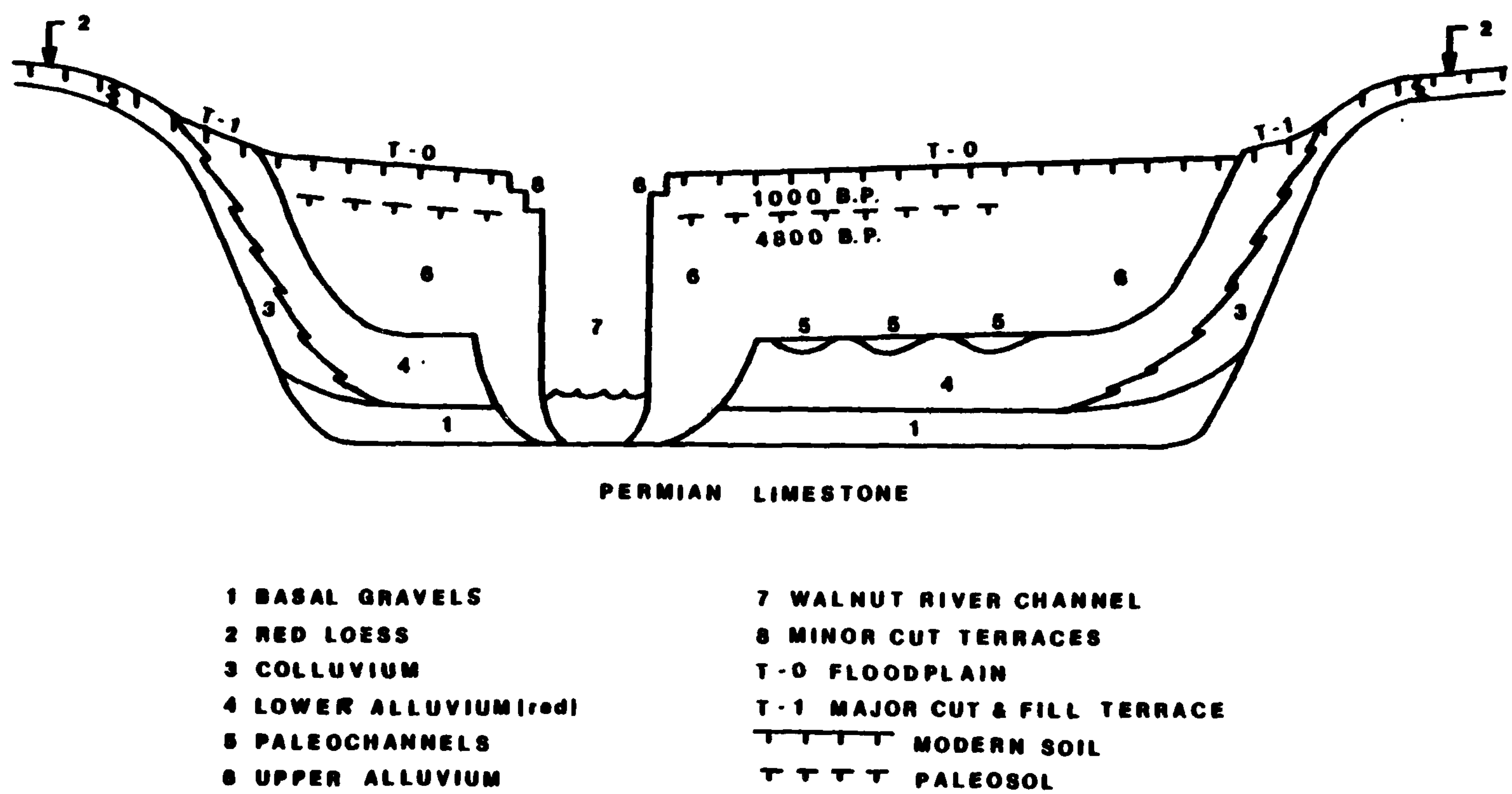

Figure 1.4. Composite cross section of the present upper Walnut River Valley, Kansas, El Dorado Lake project; no scale.

One complete rim with an applied, type 6 rim, and an orifice of 12.2 mm. The seam extends to the base of the rim making manufacture of the bottle between 1880 and 1900 (Adams 1971).

Ten fragments of pressed glass.

One rim fragment with an outflaring lip (type 13) and an orifice of 60.0 mm.

One rim fragment of pressed glass with an outflaring rim, flat lip (type 14), and an orifice of 180.0 mm.

One fragmentary, crenated rim and lip of a bowl with an orifice of 160.0 mm.

One pressed glass fragment of a bowl with a blob lip and an orifice of approximately 260.0 mm.

One fragmentary base of a square or rectangular bottle with rounded corners and lacking a kickup.

Two straight rim fragments (type 10) of a bowl with an orifice of approximately 100.0 mm.

Five straight rim fragments of pressed glass (type 12 rim).

One rim fragment with an extract top (type 7) and an orifice of 15.0 mm.

One crenated base fragment, probably to an oil burning lamp. It has a kickup and measures 130.0 mm. in diameter.

One complete, round bottle with a metal, screw cap, has the letters
VASELINE
CHESEBROUGH . The seam extends to the top of the lip, making
NEW - YORK
manufacture of the bottle after 1903 (Adams 1971) (Fig. 41c). The bottle measures 47.0 mm. in diameter and 68.0 mm. high.

Aqua

One fragment of a rectangular medicine bottle with the raised letters AWLEIGH'S
I-PAIN O .

One rim fragment of a threaded mason jar.

One rim fragment with an extract top (type 7) and an orifice of 15.0 mm.

One crenated rim fragment with an indeterminate orifice diameter.

One fragmentary medicine bottle with the raised letters "R_x Co.".

One fragment with the raised letters "RSA".

One rim fragment (type 8) with a seam extending to the top of the rim, making manufacture of the bottle after 1903 (Adams 1971). This is probably a soft drink bottle. The orifice is 15.0 mm. (Fig. 40h).

One complete rim with a packer top (type 3). The orifice is 9.2 mm. The seam extends to the middle of the neck making manufacture of the bottle between 1860 to 1880 (Adams 1971) (Fig. 40a).

One rim fragment (type 5 rim) with an orifice of 20.2 mm. The seam extends to the middle of the neck making the manufacture of the bottle probably between 1860 to 1880 (Adams 1971) (Fig. 40g).

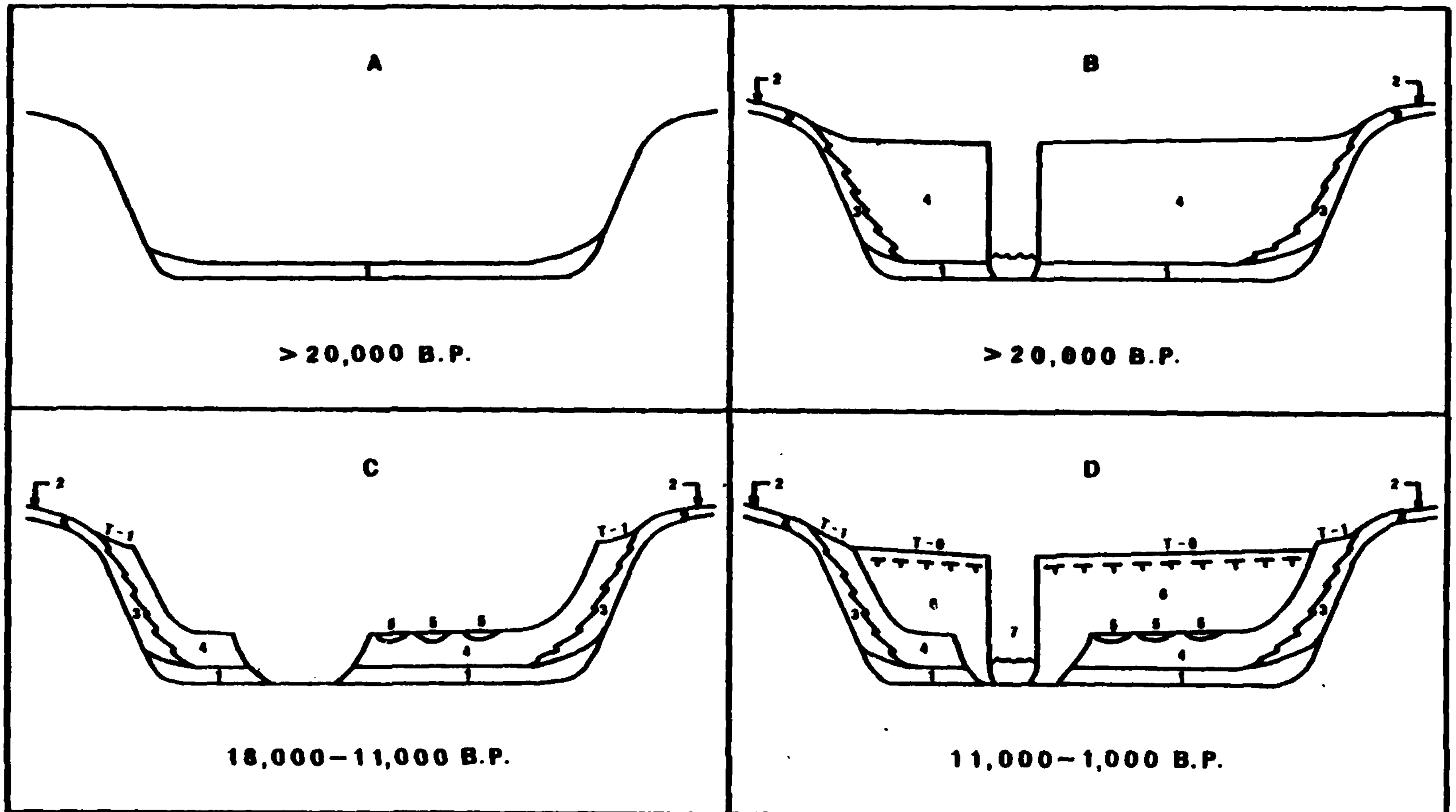

Figure 1.5. Geological history of the upper Walnut River Valley, Kansas, El Dorado Lake project; see Figure 1.4 for the present stage and unit designations; see text for descriptive data.

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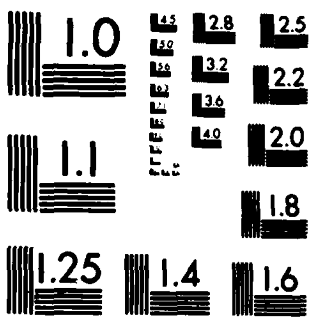

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

parent to the red alluvium, (3) the original thickness of the red alluvium, (4) the major event of the erosion of the red alluvium, (5) the subsequent deep burial of the red alluvium by the upper alluvium, (6) archeological C14 dating of about 5000 B.P. for a depth of 2.5 m. in the upper alluvium, (7) reasoning that valley filling proceeds more rapidly at first and then slows down, (8) the known areal distribution of archeological sites in relation to geomorphic units, and (9) generally accepted glacial processes and chronology.

The upper alluvium, of special interest because all known buried archeological sites are related to it, presents a major challenge in that it defies adequate subdivision. Accessibility to the total unit is a problem, and archeological excavations generally penetrate only a very minor portion of it. In general, it seems to be composed of similar sediments that contain few indicators of internal change over thousands of years. Materials appear the same throughout; bedding is essentially imperceptible; sedimentary structures are rare; no pollen has been recovered and other fossils are found only in archeological contexts; color changes are subtle; cultural materials and C14 dates have been obtained for only the past 4800 years and in the upper 2.5 m.; the only known unconformity is represented by the paleosol at approximately 50 cm. in depth; and, sediment grain size changes are inconsequential within the archeological zones, except for very slight differences in the 50 cm. above the paleosol which are related to modern soil development. Subdivision is additionally complicated by sediment disturbances related to: modern agriculture, deep bioturbation, and cycles of freeze-thaw and wetting and drying. Some mixing may also be attributed to prehistoric human activities. For these reasons, cultural debris is found only in vertical zones, rather than in specific narrowly defined stratigraphic levels.

The basic stratigraphic and sediment classifications of the area, as derived entirely from field observations, may be seen in Figures 1.7 and 1.8. The upland regolith (Fig. 1.7) is interpreted to be a red loess deposit ranging in thickness from 0-2.5 m. Units A, B, and C are seen to be soil horizons of the original loess, with C being the remnant parent material. In true upland (non-colluvial) position, the entire regolith is massive (unlayered), ungraded, fairly well sorted, and is composed mostly of silt-sized grains with abundant clay. The silt is sub-angular quartz. There are no sedimentary structures or inclusions of large grains. Colluvial regolith is much the same except that widely scattered gravel also occurs. Units A, B and C were all interpreted to be clay-silts, but with distinctive colors caused by varying degrees of weathering. Horizon thicknesses also vary widely from place to place, mainly due to overall thickness of the deposit at any given location.

The valley sequence (Fig. 1.8) is more complex, but seems straightforward. Unit E consists of coarse gravels of limestone and cherts (both gray and brown) up to 1.5 m. thick, interpreted to be residuals related to an ancient period of valley stripping. Unit D is red alluvium up to 8-10 m. thick in places. It has characteristics identical to the upland C unit except that it is much thicker and contains widely scattered small limestone gravel and many rootlet casts. Iron staining is also present.

Summary and Conclusions

The data acquired during the test excavations in conjunction with the documentary record contribute to three interrelated areas of research interest: settlement patterns, material culture changes, and economic networks (Roberts 1981).

Settlement Patterns

Roberts (1981) developed the following pattern of American settlment in the El Dorado Lake area. The first settlers built upon the floodplain of the Walnut River and its tributaries. This forested ecotone was similar to the eastern woodlands from which the settlers came. These early agriculturalists farmed the fertile bottom land.

Because of the periodic flooding of the Walnut River and its tributaries, the settlers began in the late 1860's moving their dwellings to higher ground. New settlements in the 1870's and later also occur in the uplands in order to avoid periodic flooding. The Osborn log cabin site (14BU1004) and the Donaldson stone house (14BU1008) are two examples of dwelling construction on the second bottoms.

During the 1880's a second period of settlement relocation occurred. The inhabitants who had originally built on the floodplain and moved to the second bottoms in the 1860's found that these were also prone to periodic flooding. People then moved again to higher ground. By the end of the 1880's most of the areas occupation sites were in the uplands (Roberts 1981).

Material Culture Changes

Roberts (1981) has defined some of the more important material culture changes in the El Dorado Lake area. The most important is in dwellings, with simple log cabins having been built by the first settlers followed by stone house construction between 1869-1883. Stone houses were apparently of high status. The later settlers during the expansion period built two or more storied frame houses which were popular through the early 20th century.

The high frequency of earthenware and stoneware crockery sherds in the El Dorado area is related to the raising of cattle and the settlement of the uplands. As the uplands became more economically important, dairy products such as cheese became more dominant. The large crocks, as represented in the sherd collections, were used in cheese production (Roberts 1981).

Social status and temporal change in artifacts is visible within the archeological record at the Osborn log cabin (14BU1004) and the Donaldson stone house (14BU1008). Examination of the porcelain artifacts, porcelain being a status item, shows eight porcelain buttons and two porcelain pottery

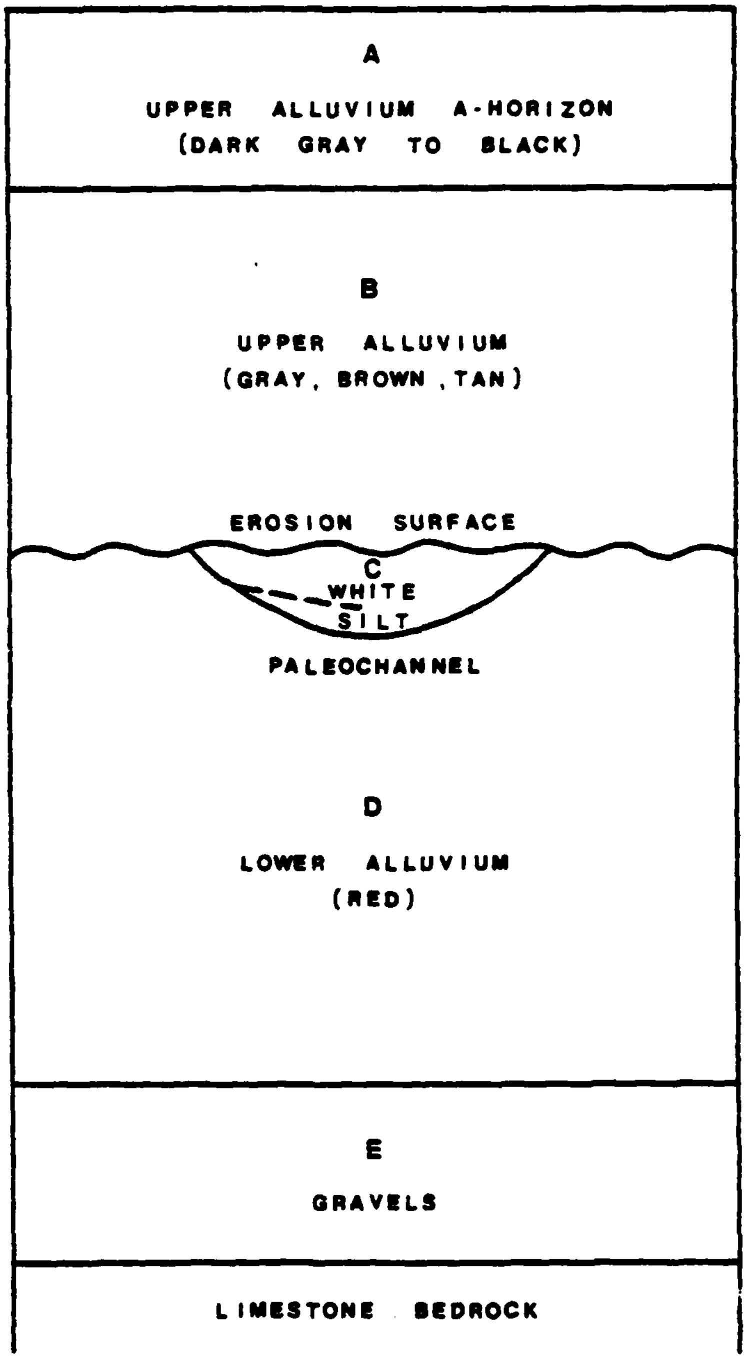

Figure 1.8. Generalized upper Walnut River Valley profile, El Dorado Lake project; no scale; see text for unit descriptions.

fragments were recovered from the Osborn log cabin site. In contrast, one porcelain button and 15 porcelain pottery fragments were recovered from the Donaldson stone house site. The greater social status of the residents of the Donaldson stone house is reflected in the greater frequency of porcelain artifacts and artifacts made of brass and copper. Few artifacts made of brass or copper were recovered from the Osborn log cabin site. Since the excavations at the Donaldson stone house were within a refuse disposal area, the temporal placement of these artifacts is difficult to assess except for a few bottles which have discernible marks.

Economic Networks

The lack of artifacts identifiable as to time and place of manufacture, except for some bottles and ceramics, makes it difficult to reconstruct early historic trade networks which operated within the El Dorado area. The only artifacts which have been identified as local products are some hand-forged iron tools. Other artifacts appear to have originated in the states of Indiana and Illinois. Some products were manufactured farther east in New York. Some of the bottles of patent medicines recovered from the Donaldson stone house indicate the use of some of these popular medicines manufactured in New York. The settlers maintained economic ties to eastern manufacturers. Larger collections with more identifiable specimens will make it possible to better define the economic networks operative during American settlement of the area (Roberts 1981).

Conclusions

The survey and testing of historic sites has produced a great deal of information. Clarification of location indicates the original Chelsea town site on Chelsea Hill will not be destroyed by the El Dorado Lake project. The material culture recovered from several early settler sites has provided new information regarding pioneer adaptations in the area. The sequence of early settlement of the floodplain, second bottoms, and finally the uplands (Roberts 1981) shows an adaptive sequence for the local settlement system.

The preservation and acquisition of knowledge about Butler County's history prior to the loss of the physical manifestations is the primary goal of this project (Roberts 1981). Additional excavations of other site types of the historic period in the area which will be destroyed by construction of El Dorado Lake will provide the necessary data to expand upon the documentary record and to develop a more complete representation of the past lifeways and cultural adaptations of our immediate ancestors in the tall grass Plains.

There is little doubt that this deposit is directly related to the upland red loess.

A major deep erosional unconformity exists on the red alluvium, and several paleochannels were incised into the subsequent surface. These channels were then filled with a whitish material (Unit C), field interpreted to be mostly quartz silt. A second much lesser erosional period followed and stripped off the tops of the channels and more of the red alluvium. About 1-1.5 m. of the channel fills remain. This unit was interpreted to be the same as the red alluvium without the red color.

Units A and B comprise the upper alluvium, and are soil horizons of it. Colors are typically gray, but they may also be tan, brown, and reddish-brown. Near the surface, the organics of the A-horizon appear black. The upper alluvium reaches 8-9 m. in thickness, and seems very homogeneous throughout. Sediments were classified in the field as silty-clays. The A-horizon is typically .5-1.0 m. thick.

The most plausible explanation for the sharp contrast in color between the lower red alluvium and the upper alluvium consisting of hues of grays, browns, and tans relates to time and weathering. It is likely that the bright red of the former signifies that it was formed itself by primary red loess deposition concurrent with inwashing freshly fallen red loess quickly redeposited from the uplands. Later, after several thousand years of valley fill erosion and concomitant upland red loess weathering, the altered upland materials refilled the valley with sediments of a distinctly different appearance. These, in turn, gained their own local distinctiveness due to climate, topography, organic action, and time.

Sediment Studies

Introduction

Detailed knowledge of sediments is a necessary part of any paleo-environmental reconstruction where sediments are involved, i.e., for most reconstructions. Study of sediments can provide information which can help determine: (1) sediment and deposit type; (2) sediment origins (source areas), transport distances, and distributions; (3) relative energy levels (stream competence); (4) environments of deposition; (5) cycles of deposition; (6) stratigraphic breaks in the record; and (7) shifts in channel positions. While field observations are useful as working hypotheses, laboratory study is necessary for confirmation and to garner yet more data impossible to achieve in the field. Thus, major goals of sediment analyses include: (1) particle size analyses, (2) particle shape and sorting determinations, and (3) particle mineral composition determinations. The latter two of these requires microscopic examination, which has not yet been accomplished. Thus far, only particle size determinations have been made, and this is a record of that phase of the sediment research.

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Sources of Sediment Data

Sediment information for the El Dorado Lake project area comes from varied sources. In the past, several hundred drill holes were made for various engineering and construction activities, and subjective sediment types were classified from field identifications alone. Many separate organizations were involved in this (unpublished) work over several years, and a number of inconsistencies are apparent in interpretation and terminology. Much of the inconsistency can be related to a lack of interest in the regolithic component, with emphasis on the underlying bedrock. The word "soil," for example, was often used as a blanket term for the entire regolith, and "clay" was sometimes used to refer to the rock shale. True meanings are often not possible to determine from the field notes. Further, these holes were mostly drilled in the uplands, whereas our interest centers primarily in the valleys where all of the subsurface archeological sites occur. However, some of this source material has proven useful in that it correlates well with some of the interpretations made in the paleogeographic model. This will be touched upon later in this section and again in the next section on experimental studies.

A second source of sediment data is more pertinent and more precise. Another investigator (Joe Artz) has had particle size analyses performed on 94 samples, ranging downward to 2.3 m. in the upper alluvium, from six archeological sites throughout the valley. Since these are to be reported elsewhere, they will not be discussed here. In this report, only sediments taken from geological contexts will be considered.

During the summer of 1979, a Kansas Geological Survey crew, under the direction of Mr. Howard O'Conner, graciously made 41 drill holes within the project area. Although these holes were multi-purpose, and not specifically sediment oriented, they did produce field observed sediment data supportive of parts of the paleogeographic model. Sediment samples were not collected from these holes because the holes were drilled rather than cored, which caused a great deal of mixing with concomitant inaccuracies. Also, since the drilling operation was on limited budgeted time, it was deemed of greater importance to drill as many holes as possible (to aid in solving other problems) rather than to slow it down to bag and label samples. Careful field observations and notes were made, however, and further discussion will ensue.

The sediment samples to be recorded here were mostly collected during the summer of 1978. They include 51 separate samples and 16 different localities within the project area (see Fig. 1.9 and Table 1.1). In addition, 2 samples from Lawrence, Kansas and 1 from several miles west of Tulsa, Oklahoma, were taken for comparative purposes to see if the idea of the widespread nature of the red loess could be given more credibility. The El Dorado Lake samples came from the interpreted geologic units as depicted in Figures 1.7 and 8, and the other three samples came from shallow upland red deposits. The 54 samples were submitted for particle size analyses to the Cooperative Extension Service, U.S. Department of Agriculture, Kansas State University, Manhattan. As noted in an earlier report (Drew 1981), some geologic units contained small

CHAPTER 10

PRELIMINARY EXCAVATIONS AT THE NEW CHELSEA SITE, 14BU1007:

THE BLACKSMITH SHOP

Ricky L. Roberts

Introduction

During the latter half of the 19th Century when the Great Plains of North America were being settled by Euro-American pioneers, thousands of towns were established. Many were successful, but many more were not. In Kansas alone, more than 2800 of the towns established during this period did not survive. Chelsea, Kansas was one of these casualties of 19th Century economics and expansionism.

Anthropologically, the western town is a central place in the mythology of the American west. It is a backdrop of hitching posts along dusty streets and saloons with swinging doors before which the great American morality play is performed. For the average American, and for many people all over the world, the simple utterance of names such as Wichita, Dodge City, or Abilene ushers in a romantic picture reinforced by years of dime novels, comic books, movies, and television shows. The notion of the forces of good meeting the forces of evil in a stentorian shootout, wherein the men in white hats triumph over those in black before the townfolks in their unpretentious houses and shops, is a bit of Americana that pervades the world. Yet, reality involved more mundane matters than meting out justice to malefic marauders. Most western towns never experienced a shoot-out, only a few were even occasionally visited by true cowboys, and many appeared and disappeared quietly with names that survive as ozymandian testaments on long-forgotten plats or as vague memories to descendents of the townspeople.

Western towns provided a much more valuable and necessary service than the fictional forum for violence with which they have been bridled by mythology. A town was the economic and social nexus for the nuclear family outliers who effected the settlement of the west. In their layouts and names, many of the towns reflect a conscious effort by the settlers to transport a recognizable form of "civilization" with them to the frontier.

Chelsea, Kansas was just such an unobtrusive urban junction for the farmers settling Butler County in the 19th Century. As Butler County's first residents moved out of the "second American frontier" in 1857 and into this border area of the Flint Hills they realized the need for a town. One of the first actions they took upon arrival was to establish a county seat they called Chelsea (after a Boston borough) and have it legally chartered. Chelsea lost its political importance to El Dorado in 1864 and quickly declined thereafter. However, the concept of the town was sufficiently strong to undergo successfully a translocation and subsequently a new physical manifestation (cf. Wilk 1981 and Thomas, this volume). The relocated Chelsea, hereafter also called the New Chelsea site, 14BU1007, was economically and demographically more successful than its predecessor but eventually met the same fate. And yet, the notion of a Chelsea community, in part supported by the existence of a Chelsea

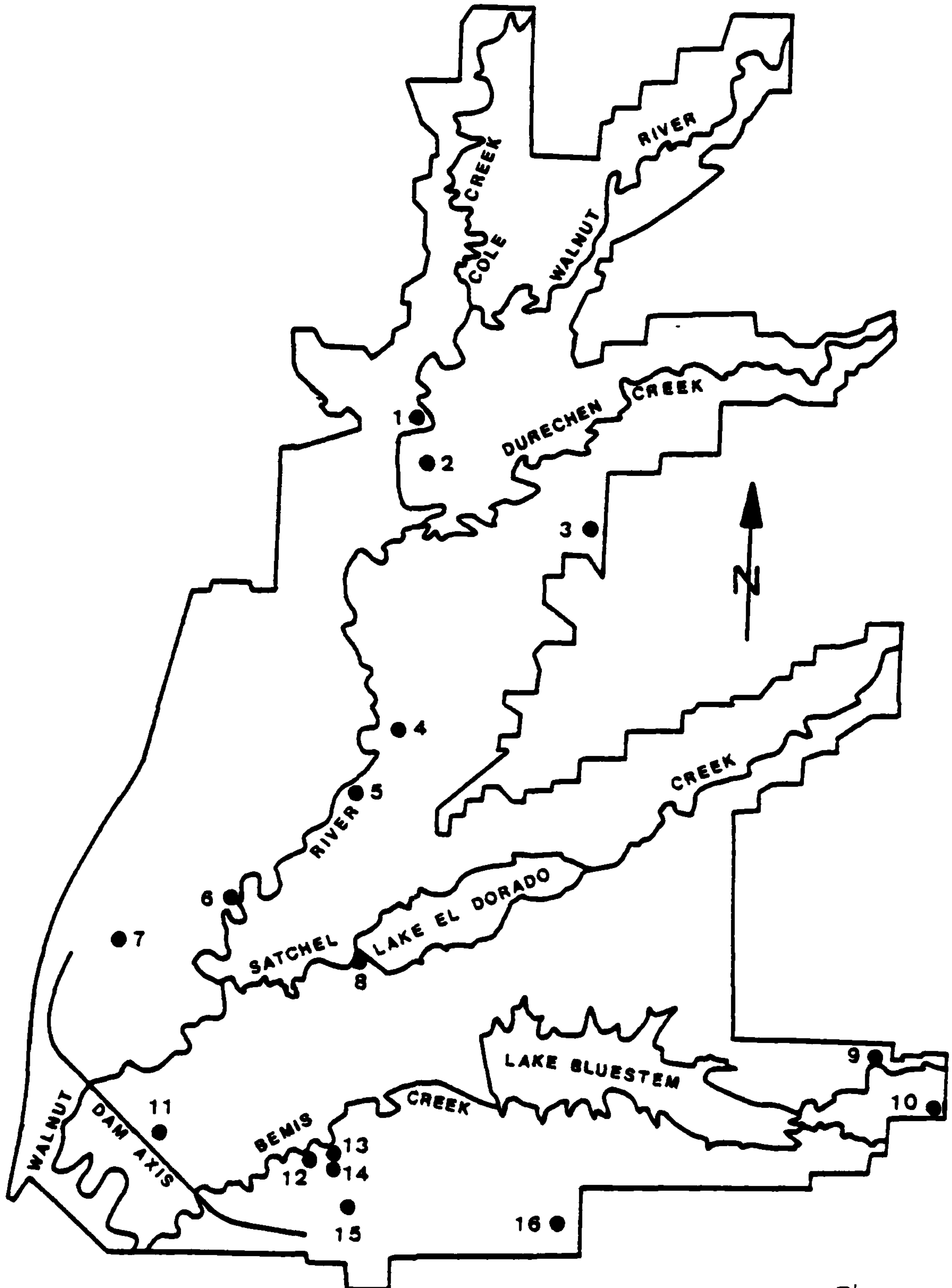


Figure 1.9. Sediment sampling locations, El Dorado Lake project.

Table 1.1. Sediment sampling location descriptions.

Location	Description
1	T24S, R6E, Sec. 32, SE¼NE¼SE¼; new railroad alignment cut; C14 date of 1885 ± 65 B.P. at about 3 m.
2	T25S, R6E, Sec. 5, NE¼NE¼NE¼; backhoe trench near archeological site 14BU81.
3	T25S, R6E, Sec. 4, NE¼NE¼SE¼; .5 miles north of Chelsea School.
4	T25S, R6E, Sec. 8, NW¼SE¼SE¼; sample 11 from upland red area, and sample 12 from bank of minor stream near farm buildings.
5	T25S, R6E, Sec. 17, NW¼SW¼NE¼; upland red unit with small remnant of black inset terrace along minor dry stream; sample 15 from gray alluvium slightly downstream near junction with Walnut River.
6	T25S, R6E, Sec. 19, NE¼NW¼NE¼; samples from backhoe trench adjacent on the south to the Snyder Site (14BU9).
7	T25S, R5E, Sec. 24, SE¼SE¼NE¼; bank of small upland cut at base of bedrock scarp.
8	T25S, R6E, Sec. 20, SW¼SW¼NE¼; just downstream from Lake El Dorado spillway; older red alluvium separated horizontally from more recent gray alluvium by bedrock outcrop.
9	T25S, R6E, Sec. 26, NE¼NE¼NE¼; from north bank of Bemis Creek at bend.
10	T25S, R6E, Sec. 25, SE¼SE¼NW¼; at juncture of uplands with valley alluvium of Bemis Creek.
11	T25S, R6E, Sec. 30, N½SE¼SW¼; valley geological type site bulldozer cut in bank of Bemis Creek diversion canal.
12	T25S, R6E, Sec. 29, NE¼SE¼SW¼; bulldozer cut in Bemis Creek alluvium in borrow pit.
13&14	T25S, R6E, Sec. 29, SE¼SE¼SW¼; bulldozer cut in Bemis Creek alluvium in borrow pit.
15	T25S, R6E, Sec. 32, NW¼SW¼NE¼; site of mammal mandible find south of El Dorado Lake Overlook near Corps of Engineers Project Office.
16	T25S, R6E, Sec. 33, NW¼SE¼NE¼; upland geologic type site in bank of small stream draining into a field pond.

activities centered about the town. Chelsea, as were its counterparts throughout the Great Plains, was a central place, performing central functions for the rural populace while remaining small (cf. Wilk 1981; Hudson 1979: 107).

Chelsea was an inland town, i.e., not on a railroad. Such towns generally thrive during the initial pioneer period but usually succumb after a railhead is established (Hudson 1977: 114). In one particular study of county seats, the lack of a railroad was among the four most common reasons for such towns to lose their political position (Smith and Davidson 1975:35). When the townspeople were particularly determined to maintain a town, translocation was not unusual as a response to declining fortunes. After Chelsea lost the county seat to El Dorado in 1864, members of the community, specifically George Donaldson, took such a course of action. The translocation began ca. 1868, and by 1870 the town was formally relocated with a new town company and a state charter. The town prospered for a few years, but by 1878 it had failed again and was undergoing a slow dying process.

At the present time, little is known about the physical appearance and layout of original Chelsea. There is a record of a plat having been made, but extensive documentary research among state and county records has failed to uncover it. Fortunately, translocated Chelsea is better documented.

Two plats of the New Chelsea site have been located. The first is a hand-drawn plat believed produced ca. 1868 (Fig.10.1). The second is an 1882 transcription of a surveyor's plat drawn in March, 1870 (Fig.10.2). A comparison of the two shows several inconsistencies. However, by using the legal description of the town contained in the town charter, it was possible to reconstruct a plat of the town that is believed to be accurate (Fig.10.3).

Translocated Chelsea occupied approximately one eighth of a section of land owned by George Donaldson. Donaldson's residence, in fact, is shown as the southern boundary of the town on both plats. The presence of the town on Donaldson's land is indicative of his important involvement in attempting to resuscitate the economically choking Chelsea. His premature death in 1869 is believed to be a significant contributing factor to the ultimate failure of the translocated town.

Chelsea was 145 rods and 9 feet (2401.5 feet, 731.98m) north to south and 60 rods and 8 feet (998 feet, 304.19m) east to west. It was comprised of 31 blocks set aside for commercial or residential lots and one block for the public square. Blocks along the east and west boundaries of the town were single blocks of four lots each, the remaining parcels were double blocks with 16 foot alleys and eight lots each. Lots outside the business district which surrounded the square, measured 55 x 120 feet. Those lots fronting the square on the east and west were 22 x 110 feet and those on the north and south, 24 x 110, providing 40 business lots on the square. Roads that passed through the business district were 90 feet wide, all others were 66 feet with the exception of the northern-most which was 57 feet, 6 inches.

This formal arrangement of the town is significant in several respects that will be discussed. Cultural geographers have defined this as a "block

amounts of grains larger than sand size. The laboratory procedure for particle size analysis, however, does not take these into account, and their significance must be dealt with separately. The analyses produce only relative percentages for the sand, silt and clay fractions. The determinations from these tests are listed in Table 1.2. The "Unit" category follows the profiles in Figures 1.7 and 8, except where the sample does not apply to either an upland or valley situation in the strictest sense. Most of the nonconforming cases fall into a colluvial context, and the rest fit no special category.

Discussion

Nothing spectacular can be interpreted from the results of the particle size analyses. They generally conform to what was anticipated by the field observations and to the conditions set forth in the paleogeographic model. Thus, their main function here is as reinforcing agents, which was a stated purpose for the tests. However, in some instances, it will be necessary to revise the model slightly due to the new information, and it is now possible to expand it in certain directions.

Upland units A, B and C (Fig. 1.7) are verified to be clay-silts, as previously interpreted in the field. Also, based on particle size results, the loess origin hypothesis for the upland regolith is still viable. However, the potential source area and the transportation distance of this alleged eolian deposit remain unknown. Based on grain size and color alone, there is no doubt that this material blankets all the uplands of the project area, and well beyond. How far beyond is a moot question without a major research effort well outside the scope of the current study. Sample 52 from Lawrence, Kansas, compares favorably with those of the same unit at El Dorado, but this is no more than suggestive. The Oklahoma sample (54) seems to have no relationship to the El Dorado regolith, and is probably derived from local red sandstone. The possibility must not be overlooked, however, that the ultimate source for widespread eolian deposits in eastern Kansas could be from such outcroppings. As the sandstones disintegrated into smaller particles, they could have been carried over Kansas and dropped there, providing the paleo-winds were of the right velocity and direction. Red sandstones occur both to the south and to the west of the project area.

Two "surprises" appear in the tests on the valley sediments. The first of these is minor in that field interpretations were that the upper alluvium contained more clay than actually is the case. The A and B units (Fig. 1.8) were believed to be silty-clays, but the silt rather strongly overshadows the clay fraction, and they must be re-classified as clay-silts. The most unexpected result from the entire set of 54 sample tests is for valley unit C (Fig. 1.8). This paleochannel fill was thought to be almost pure silt, and to have been derived from the silty lower alluvium into which the channel is cut. However, it (sample 32) contains 64.4% sand and only 18.4% silt. The sand is certainly quite fine, but a definite change in energy level of a magnitude greater than surmised is apparent. Further, the source area is now no longer so easy to guess. None of the other tests, except for the Oklahoma sample, produced such a

Chelsea Mann

Being part of [illegible] Sec [illegible] Township 24 [illegible] Range [illegible]
E to wit commencing at [illegible] NE cor of [illegible] quarter Sec
Thence west [illegible] ft thence south 145 rods and [illegible] ft
Thence East [illegible] rods & [illegible] ft thence North [illegible] rods & [illegible] to [illegible]
beginning

TABLE 1.2. - continued

Location	Sample	Area	Unit	% Sand	% Silt	% Clay
8	25	V	A	20.2	63.2	16.6
9	26	V	D	16.2	52.0	31.8
10	27	U	Colluvium; 40 cm. B.S.	21.2	40.2	38.8
11	28	V	A	16.0	44.6	39.4
11	29	V	B	15.6	51.6	32.8
11	30	V	B; lateral to sample 29	18.4	44.8	36.8
11	31	V	B; lateral to sample 29	16.4	46.8	36.8
11	32	V	C; paleochannel fill	64.4	18.4	17.2
11	33	V	D	22.4	53.0	24.6
11	34	V	D	21.4	55.0	23.6
11	35	V	D	21.4	53.6	25.0
12	36	V	A; 50 cm. B.S.	15.4	57.0	27.6
12	37	V	B; 150 cm. B.S.	16.2	51.2	32.6
12	38	V	B; 250 cm. B.S.	15.8	52.2	32.0
13	39	V	A; 25 cm. B.S.	28.8	45.6	25.6
13	40	V	B; 200 cm. B.S.	19.4	51.0	29.6
13	41	V	B; 100 cm. B.S.	20.2	45.2	34.6
13	42	V	D; 300 cm. B.S.	24.2	49.6	26.2
14	43	V	Soil A-horizon on Unit D	16.2	41.2	42.6
14	44	V	D; 75 cm. B.S.	18.2	47.2	34.6
14	45	V	D; 300 cm. B.S.	24.2	46.2	29.6
15	46	U	Colluvium	15.8	44.4	39.8
15	47	U	Colluvial contact with C	17.6	51.2	31.2

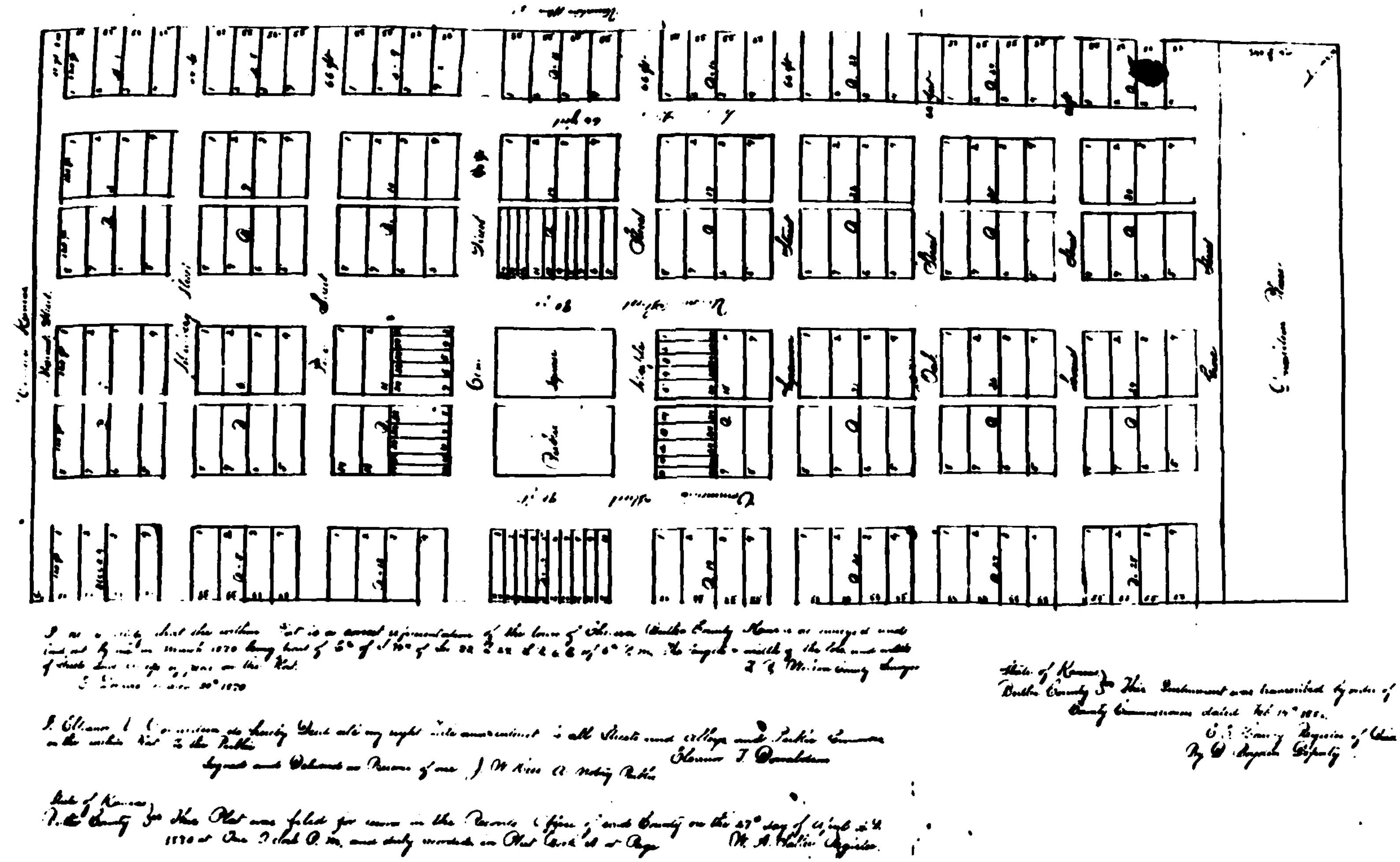


Figure 10.2. Transcription of 1870 surveyor's plat of Chelsea.

TABLE 1.2. - continued

Location	Sample	Area	Unit	% Sand	% Silt	% Clay
15	48	U	C	17.6	56.0	26.4
15	49	U	Rodent burrow fill	17.2	51.4	13.4
16	50	U	C	20.4	47.4	32.2
16	51	U	A	27.4	41.4	31.2
Lawrence	52	U	B	20.8	46.8	32.4
Lawrence	53	U	A	21.8	58.4	19.8
Oklahoma	54	U	?	74.8	14.4	10.8

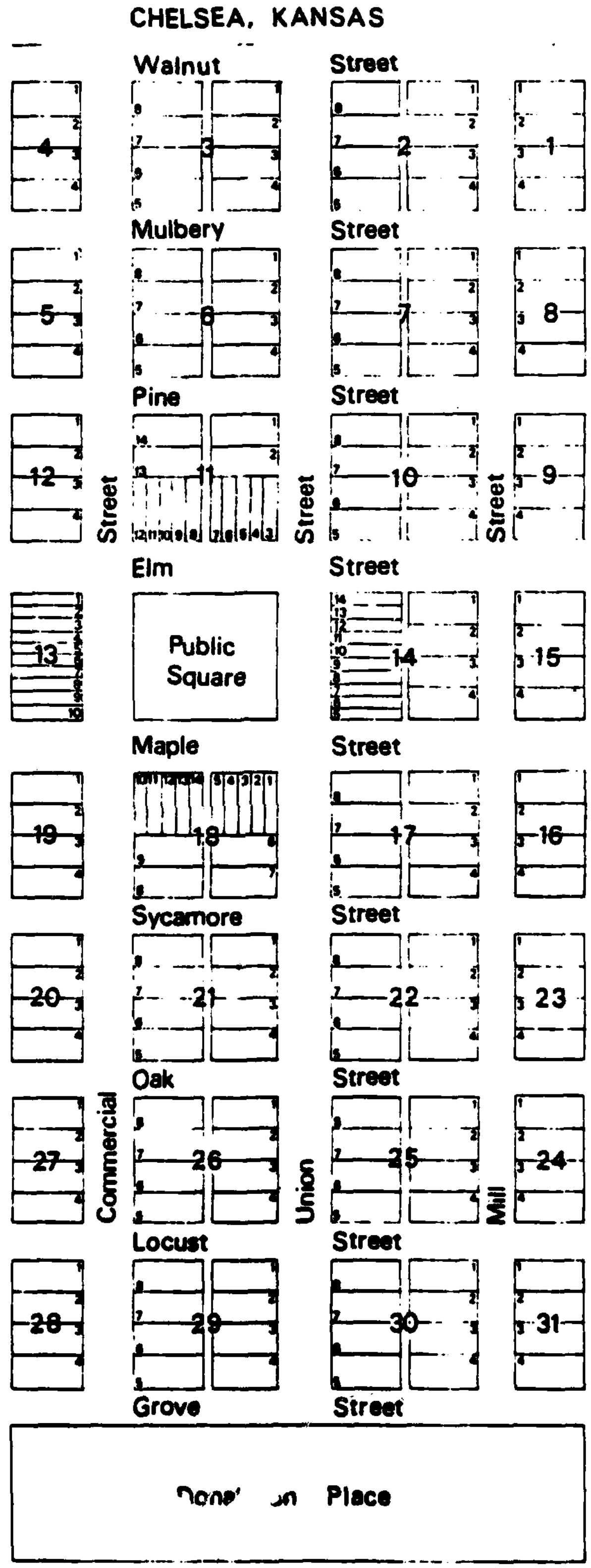


Figure 10.3. Composite plat of Chelsea.

high percentage of sand. Indeed, the next highest is 28.8% (sample 39), and most are much lower still. It is interesting to note too that sample 4, from a much more recent channel fill, has only 21.8% sand and a high 65.6% silt content. This suggests either a significant relative difference in the energy levels of the two paleochannels, or that there is a very fine line of distinction between the silt and sand grain sizes for one or both of these samples.

The lower alluvium (Fig. 1.8, Unit D) is verified to be clay-silt from a number of tests. If grain sizes are contrasted with the results for the more recent upper alluvium, there is little apparent difference. There is slightly more sand in the lower unit, and field observations indicate more (and larger) gravel as well. This points to a relatively higher energy regime for the lower unit, at least at times. A comparison of grain sizes for the red alluvium with those in the uplands shows that, in most cases, there is a distinctly lower silt content and somewhat higher clay content in the uplands. Why this should be is uncertain, but the knowledge could be useful in helping to distinguish between the two in cases where the uplands blend in rather inconspicuously with the valleys. That is, a silt content of say 46% may suggest upland loess, whereas a value of say 52% may indicate valley lower red alluvium; the two different environments of deposition may therefore be differentiated.

In cases where several vertical samples were taken in the upper alluvium (samples 5-8, 16-20, and 36-38), no major fluctuations in particle sizes occur to suggest that this unit is subdividable on this basis. This compares with results of the particle size analyses on sediments from archeological contexts, as mentioned previously, and, as with the archeological samples, the geologic ones were restricted to rather shallow depths. None came from more than 3 m. below the surface, which is the approximate limit of both available natural exposures and backhoe and bulldozer cuts.

Samples from areas considered colluvial proved to have expectable results. Such sediments should reflect higher energy conditions, and they do. For example, if designated valley colluvial samples 1-3 are compared with valley alluvial sediments such as samples 5-8 and 16-20, the former are somewhat more coarse, even without considering gravel content. The extra coarseness may be attributed to the sampling location near the uplands and the juncture of an incoming upland tributary. If these same valley colluvial samples 1-3 are related to designated upland colluvial samples 9, 10 and 46, there is a remarkable difference in the silt and clay fractions. The sand content is similar, but the uplands show much less silt and much more clay. When the larger sizes of the valley gravels are also considered, it is clear that the energy system of the valley is significantly greater than that responsible for the slopewash gravity deposition on the upland slopes. Also, were it not for the gravel content of the upland colluvium, which is not present in the non-colluvial upland regolith, there would be little to distinguish between the two on grounds of grain size.

As previously mentioned, supplemental information pertaining to sediments may be gleaned from the 1979 Kansas Geological Survey drilling,

square" town pattern (Price 1968:30). The prototype of this pattern can be traced to the 17th Century in the New World, but the first significant occurrence of the design was in a number of towns in southern middle Tennessee during the early 19th Century. These towns were all county seats and laid out so that a courthouse sat in the center of a centrally located square. This distinct pattern has been designated "Shelbyville" (after Shelbyville, Tennessee). The block square pattern is a derivative of the Shelbyville pattern distinguished by the lack of a central courthouse.

From its point of origin the Shelbyville pattern spread. It became most popular in the states of Indiana, Illinois, and Iowa, but was common throughout most of what is referred to as the second American frontier. By noting the dates of occurrence for towns of this design, a westward trend in the spread proceeding through the aforementioned states can be detected during the first half of the 19th Century. At the culmination of this expansion are the only two recorded instances of this pattern in Kansas, one in 1857 and the other in 1860 (Price 1968, Fig. 16). Chelsea now raises that to three recorded instances.

Innovation in town design was rare, people generally copied other towns (Price 1968:29). The conservatism of rural town planners appears to be born out by Chelsea, because the areas where the Shelbyville pattern was the most popular are the same areas from which the settlers who established the town came.

There can be no doubt that the Chelseaites intended eventually to put a courthouse in the square (after winning back the county seat), although most Kansas towns have the courthouse outside the business district, as is the case with El Dorado. Since this pattern is so rare in Kansas it can be surmised that the design was part of the cultural baggage that the settlers brought with them. Aside from familiarity, this pattern had several other characteristics to recommend it: it is a simple design, easy to lay out and it conforms well with the township-range system of demarcating the land.

One of the prime considerations in moving the town was to increase the possibilities of obtaining a railroad, yet the town was not platted in the manner typical of other Plains towns anticipating a spur (a railroad line). Generally towns anticipating a railroad were of the form known as "T-town." Such towns retained a rectangular grid but were oriented according to where the railroad would intersect them (Hudson 1977:103). The absence of this design suggests that the Chelsea planners, while hoping for a spur, were realistic in assessing the probabilities of obtaining a line and platted the town in the most convenient manner.

Excavation Method and Differential Agricultural Disturbance at the New Chelsea Site

Approximately 80% or more of the area formerly occupied by Chelsea was, subsequent to the town's abandonment, put under cultivation. Therefore, any large scale investigation of Chelsea would necessitate a research design that would incorporate extracting data from disturbed deposits. The excavations undertaken during Phase II were designed in part to determine the extent to which the recovered data could be used to reconstruct human behavior.

and from the hundreds of other holes drilled within the area over the years. The records of the old holes (to be referenced and discussed at greater length in the next section), despite the aforementioned problems, provide sediment distributional data over several long transects in the project area. The field notes and profiles indicate reasonably well where valley alluvium ends and upland regolith begins, and the sediment classifications generally correspond to the paleogeographic model, both for type and for stratigraphic relations. They portray the uplands as being covered throughout by a red silt-clay material, grading to reddish-brown, and then to darker brown towards the top; the valleys are recorded as being filled with alluvial silts of varying colors up to about 9 m. thick, with underlying gravels. The silt-clay classification for the uplands (in reality clay-silt) is a minor discrepancy, and is easily accounted for by the inherent imperfections of field interpretations. These data also point to thickness distributions which indicate that the upland regolith is relatively thin on tops and higher slopes, and is thicker on lower slopes and in more sheltered areas. This is one line of evidence used in hypothesizing a loess origin for the upland regolith (Drew 1981).

The Kansas Geological Survey holes served several purposes. The previous drilling was mostly confined to the uplands, and thus provided little information for alluvial areas. Therefore, the newer holes were placed almost exclusively in the Walnut River trough. Just one hole was drilled in an actual upland position, and this only as a starting point for a long transect across the floodplain to the river. The overall operation was to determine: depth to bedrock, valley floor configuration, terrace limits and contacts, and vertical and horizontal limits of stratigraphic units (i.e., to test the stratigraphy as depicted in the paleogeographic model). Recovery of sediment data was considered to be a bonus. Nevertheless, these holes revealed the essential correctness of the sediment aspects of the model, and added a bit more information as well. It was discovered that gravel content of the alluvium is remarkably small, especially in the upper alluvium. Further, no large gravel was found within alluvium, and most recovered did not exceed 2-5 mm. The larger pieces are near the bedrock contact, and are mostly calcareous fragments derived from it. The smaller gravels scattered about in the alluvium are also mostly calcareous. Acid testing of a great number of samples indicated that neither the lower red alluvium nor the upland regolith are at all calcareous, but that the upper alluvium may be very slightly so.

Knowledge of the sediments, as currently understood, generally supports the paleogeographic model and points to an overall relative stability of the stream system from inception of lower red alluvial deposition to the present. Uniformity seems to have been the rule, as little variation is detectable in the sediments, either vertically or horizontally. Particle size analyses indicate only slightly higher energy levels for the lower alluvium over the upper alluvium. Thus, in the entire history revealed by the valley deposits, the only really significant event of change appears to have been the major episode of erosion which separates these two units. In comparison, the unconformity represented by the paleosol near the surface of the upper alluvium is quite minor.

There have been a number of studies demonstrating the potential (and pitfalls) of data recovery from disturbed sites (Binford et al. 1970; Redman 1973; Redman and Watson 1970; Schiffer and Rathje 1973; Talmadge and Chesler 1977; Turbowitz 1976). It was assumed from the outset that surface deposits reflected activity areas. Therefore, historic material surface concentrations were used to place test units.

Limited scale excavation was designed to define areas suitable for large scale investigation. The fieldwork plan called for test units to be placed in the areas where surface concentrations of historic materials were present. Inclement weather forced a delay in harvesting wheat from the field and resulted in an alteration of the excavation plan. The delay in harvesting and the following dry period resulted in poor ground visibility even after the field had been disked twice. It was necessary to place excavation units on the basis of the previous summer's observations.

A datum point, designated 500N 500E, was established at the north end of the field (Fig. 10.4). All test units were gridded in accordance with this datum. The first area of limited scale excavation, the central area, was established in an area near the center of the field. Additional units were placed east and west of the central area in approximate locations where surface scatters were noted during the Phase II survey. These tests did not produce any evidence of town associated features. Work was concentrated on a fifth area, located south of the central Test area with historic material visible on the surface. This area contained minimally disturbed, subplowzone features relating to a blacksmith shop.

Excavation units were 1 x 1 meter squares subdivided into four 50 x 50 centimeter quadrants. Each quadrant was hand troweled in arbitrary 10 cm units. Each excavation unit received a unique number in the sequence in which it was excavated. Quadrants were always numbered 1 through 4, clockwise from the northeast. All material was bagged by unit, quadrant, and level.

Making levels 10 cm thick was an arbitrary decision, based on the convenience of the measure and the familiarity of the excavators with such an excavation strategy. However, removing the plowzone in more than one level was a purposeful decision. This technique permits comparisons to be made between the upper part of the plowzone and the lower, thus providing a limited amount of control to study the differential affects of shallow or surface disturbance versus deeper disturbances.

"Plowing" is often used as a generic term for any type of agricultural soil disturbance. The resulting lateral displacement of artifacts is attributed to "plow drag" (Roper 1976:32). However, plowing is only one of a number of farming activities that can result in the disturbance of an archaeological deposit. The type of soil disturbance a given field has been subjected to is a function of what was being planted, what had previously been planted, the geographic location of the field, the time period of cultivation, and the specific agricultural techniques employed. A general division can be produced by distinguishing between those techniques that primarily disturb the surface and upper centimeters such as disking, planting, harvesting, etc.; and those that penetrate deeply beneath the surface, i.e., plowing, deep disking, furrowing, etc.

Perhaps long term cycles could be postulated for the valley in which major erosion is followed by lengthy periods of uniform deposition. Two such couplets are suggested by the sediments and stratigraphy in the Walnut River Valley: (1) the original valley stripping followed by deposition of the red alluvium, and (2) the major unconformity on the red alluvium followed by deposition of the upper alluvium. Recent cutting on the floodplain could foretell the beginning of yet a third cycle.

Experimental Studies

Introduction

Research conducted prior to actual field work to obtain geomorphic information for the El Dorado Lake project provided little in the way of published material. What did exist had almost no pertinence for the development of a paleogeographic model for the Late Quaternary of the area. Before the current field investigations began during the summer of 1978, geology work done within the entire region pertained primarily to deep subsurface bedrock studies for oil exploration (Fath 1921), and later to the water quality of the Walnut River consequent to its pollution by the oil industry (Leonard 1972). In addition, exploration had been carried out to locate sources of lithic building materials such as gravel and limestone (Hargadine 1969). However, an abundance of other activities over the past 50-60 years was responsible for the accumulation of vast amounts of field notes and other unpublished data. Although most of this material pertains to engineering and construction and has no apparent direct relation to paleogeography, it seemed probable that some information of value could be derived from it. The overall rationale for the experimental studies to be discussed is based on: (1) the idea that this storehouse of untapped material should be put to use and not wasted, and (2) the assumption that something useful may result, i.e., subsurface maps.

Old Data Used in Experimental Studies

These data consist of field notes, and derived profiles, recording hundreds of drill holes throughout the project area. Kansas Department of Transportation geologists had made many of these holes to learn about subsurface conditions prior to the construction of highways and railroads (unpublished data on file at the Kansas Department of Transportation, Topeka). Holes were made along transects for dams for Lake El Dorado and Lake Bluestem (unpublished data on file with the Office of the City Engineer, El Dorado, Kansas). Once the major new dam project got under way, many more holes were drilled preparatory to construction of the dam itself (unpublished data on file with U.S. Army Corps of Engineers' offices in Tulsa, Oklahoma, and El Dorado, Kansas). Related to the new dam were concurrent construction activities for the re-alignment of existing roads and rail lines (which would be flooded) and the building of new park and access roads. Drill holes were also made for these purposes (unpublished data on file at Kansas Department of Transportation offices in Topeka and El Dorado, Kansas, and with U.S. Army Corps of Engineers offices in Tulsa, Oklahoma, and El Dorado, Kansas).

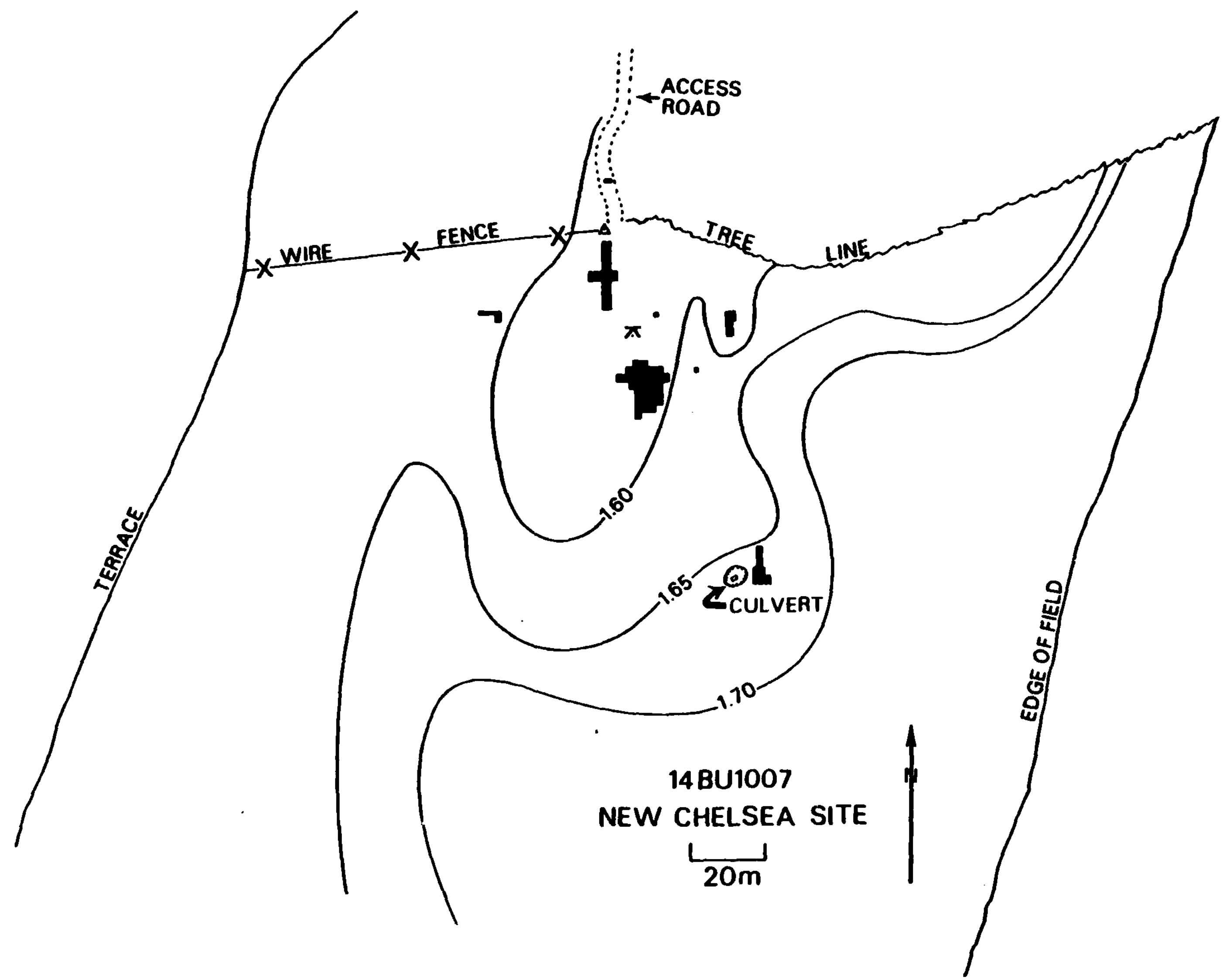


Figure 10.4. New Chelsea site excavations

New Data Used in Experimental Studies

The unpublished drill hole information is abundant, but lacks the distributional continuity necessary for the envisioned results. It also is not capable of solving certain subsurface problems relating to the confirmation of the paleogeographic model. Therefore, the Kansas Geological Survey was asked to drill supplemental holes to help fill some of the gaps. As previously mentioned, these new holes were concentrated in the valley alluvium, and the overall operation was to determine: depth to bedrock, valley floor configuration, terrace limits and contacts, and vertical and horizontal limits of stratigraphic units. In all, 41 holes were drilled for a total of 770 feet, an average of 18.78 feet per hole. The holes ranged from 1-32 feet in depth. These provided sediment information (as discussed), confirmed relationships between the upper and lower alluvium and between the T-1 terrace and other valley units, and suggested locations where future test trenching would be productive in providing more geomorphic data. They also produced depth to bedrock measurements and other useful information pertaining to the bedrock surface; these were used in the experimental studies.

Specific Rationale of Experimental Studies

The old and new drill hole data provide four informational variables which can be used in the construction of two kinds of subsurface maps: (1) the specific location of the hole, (2) the surface elevation at the hole location, (3) the depth of the regolith to the bedrock surface, and (4) the elevation of the bedrock surface. They can also provide limited information on sediment types and thicknesses, which would be of interest for separating the upper (culture-bearing) alluvium from the lower (non culture-bearing) red alluvium.

With these data available, but with no guarantee of success, it was considered experimentally worthwhile to make an attempt to compile the two maps. One of these could be a contour map of the surface of the bedrock. This "bedrock surface configuration map" would be of geomorphic value because it would indicate the topography and drainage patterns of the upper Walnut River Valley prior to the establishment of the modern river and its deposits. It might also indicate bedrock controls, if any, on alluvial buildup and surface topographic expression. This type of information would be useful to the overall paleogeographic reconstruction. For this map, bedrock surface elevations are needed. These can be derived from a knowledge of the regolith surface elevation and the depth to bedrock value, in those cases where the drill hole extends at least to bedrock.

The other, and more important, of the two maps is one which depicts contours which record relative thicknesses of the regolith from place to place. This "depth to bedrock contour map" requires only depth to bedrock values, other than knowledge of the location of the hole. Such a map would constitute a framework of basic geologic knowledge which may be of potentially great value to archeology. It might define vertical and horizontal limits for sediments and strata (and thus for buried archeological

That portion of the New Chelsea site under investigation during Phase II had been a wheat field since ca. 1900-1910 (T.R. Holderman, former land owner, personal communication). At the time it was first cultivated and several decades thereafter, the steel plow was the most common form of soil disturbance. This was true plowing, i.e., cutting to the maximum depth that the soil will be broken and inverting the soil. After the "Dust Bowl" years of the 1930s, new, less soil destructive means of cultivation were employed. True plowing is now infrequent; shallow disking, affecting only the surface and several inches below it, is now most frequent. Interviews with area farmers indicate that a depth of 3-4 inches was the common disk penetration (approximately 10 cm).

It was hypothesized that surface techniques produce more lateral displacement of artifacts than true plowing does. The test implication is that artifacts from level 1 will show greater dispersion through the excavation while those from level 2 will conform more closely to the original depositional pattern. When levels 1 and 2 from the block excavation centering on the blacksmith shop are compared it can be seen that the distributions from level 2 correspond with postulated disposal areas, whereas the level 1 distributions indicate more randomly distributed artifacts (distribution maps can be found below in the artifact discussion section). The most striking example involves the clinker assemblage distributions and Feature 2, a clinker pit. A significantly large number of clinkers was recovered from those units containing and near Feature 2. Similar noticeably large clusters were absent from those units in level 1. In fact, level 1's distribution is far more dispersed than level 2. Using these data it is possible to reject the null hypothesis of no difference in degree of lateral displacement between levels.

Artifacts from the surface and level 1 show more displacement than those from level 2. However, this fact may be attributable to degree as well as type of disturbance, i.e., lateral displacement in level 1 may be due as much to the fact that the surface and first 10 cm are disturbed much more frequently than the lower 10, as to any basic differences in the affects of various techniques. Such a consideration is discounted in this instance because the time during which deep disturbance predominated is estimated to be roughly equal to the number of years surface and shallow techniques have been employed.

An Archaeological Approach to "Community"

The investigation of the New Chelsea site has been expressly formulated to explore an historic community through the techniques of archaeology and ethnohistory. Ultimately this project will achieve (1) a reconstruction of the town and its development, (2) a model of its material culture and the economic links from which such goods derived, and (3) an understanding of how Chelsea relates to other such communities and the settling of the American west. In short, this project attempts to use a community as the focus for archaeological research, in much the same manner that cultural anthropologists have recognized it as a valid unit or object of study (Arensberg 1961).

The following constitute the steps involved in this project:

sites) by setting predictive limits for site locations and relative ages. If, indeed, not only depth to bedrock contours could be mapped, but depth of individual regolithic units could be as well, then even more archeological refinement is possible. For example, if the upper alluvium at El Dorado could be map delineated, both vertically and horizontally, it may be that all buried archeological sites of the area would also be so delineated as buried sites are not believed to occur within any other geologic unit.

Map Construction: Procedure and Results

All of the available unpublished field notes and profiles were consulted for the necessary map compilation components for the two proposed maps. A total of 572 location points were plotted and numbered on 1:24,000 scale U.S.G.S. topographic maps. Of these, 531 came from old data and 41 from the 1979 K.G.S. drilling records (Figure 1.10 is an index of the transects along which the points were plotted, and Table 1.3 records the locations of the transects). The numbered points were listed in chart form with columns provided for: (1) the geomorphic area of the point (upland or valley), (2) the surface elevation of the regolith at the point, (3) the depth to bedrock at the point, (4) the calculated bedrock surface elevation beneath the point, (5) sediment unit descriptions from top to bottom, and (6) individual thicknesses of each sediment unit from top to bottom. In several instances, information was not available to fill all the columns for a point. This usually limited the point's usefulness of application to the compilation of one map or the other, but not both.

It was hoped that this mass of data would enable the reliable construction of one or both of the subsurface maps. The total number of points would be adequate for them to be made, if their distribution was appropriate. However, that is not the case. They are much too scattered and far apart for mapping purposes, and points in the alluvium (where maps are most desirable) are particularly inadequate. There is no area where points are clustered well enough for use in compiling reliable maps of any kind. Thus, the "experimental studies" are just as that term implies, and the results are fruitless as far as specifically stated goals are concerned.

1. Reconstruct Chelsea through historic and ethnohistoric research.
2. Sample the site through excavation to produce a reconstruction of the town's material culture.
3. Obtain samples of the material culture of outlying settlements.
4. Using both known and unknown historic associations, test the validity of material culture as a means of defining a community.
5. Define and reconstruct economic relationships revealed by Chelsea's material culture.
6. Relate the Chelsea pattern to those other historic communities.

Phases II and III of this project have been devoted to acquiring data specified by the first three steps. In Phase IV these activities will be concluded. The final three steps will be complete during the projected synthesis phases at the conclusion of the fieldwork.

This report focuses on reconstructing a blacksmith shop. Additional data have been presented that relate to the organization of the town. The conclusion will include projections for completing the steps listed above.

Excavations at The Blacksmith Shop

Features

Four subplowzone features were revealed during excavation at the New Chelsea site (Fig. 10.5). All were associated with the blacksmith shop. A discussion and interpretation of each feature is presented below.

Feature 1 was a concentration of brick and limestone encountered as the first test unit in this area was excavated (Fig. 10.6). It averaged approximately 40 cm in diameter. This diameter was maintained to the bottom of the feature at 33.5 cm below the surface. The soil around the feature was noticeably harder than that in the other units. It could almost be classified as baked, but there was no direct evidence of burning.

Most of the brick occurred in the upper portion of the feature. None was present at the bottom. The brick had an orangish color, a high sand content, and limestone inclusions. Based on comparisons with other brick specimens, it is suggested that these were locally produced. Some of the pieces had mortar adhering, although neither brick nor limestone in the feature were mortared together.

The pieces of limestone were irregular field stones varying from more than a kilogram to a few grams (gravel) in size. The area around the feature once had a limestone cobble layer, therefore some of the smaller pieces may have been mixed in over the years of disturbance. Mortar did not adhere to any of the limestone pieces but bits of mortar were recovered throughout the feature. A number of the pieces, particularly those near the top, had a chalky texture typical of limestone that has been burned. However, there was no sign of heat discoloration.

The appearance of Feature 1 was not unlike that of Feature 3, a post support, at 14BU1008 (cf. Brown, this report). However, there was no evidence of a post stain in Feature 1. The feature is interpreted instead as the foundation for a forge. This interpretation is based upon the feature

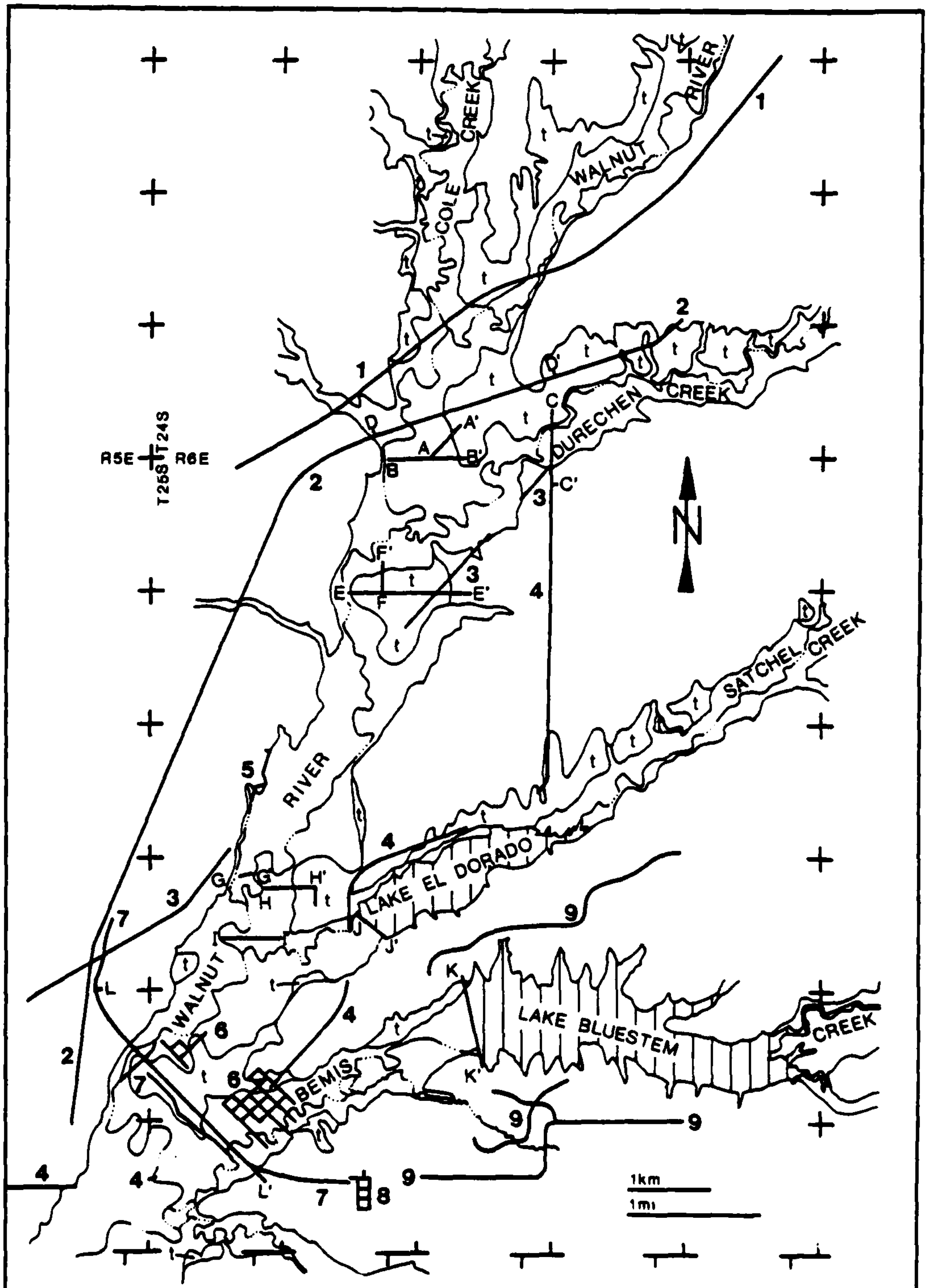
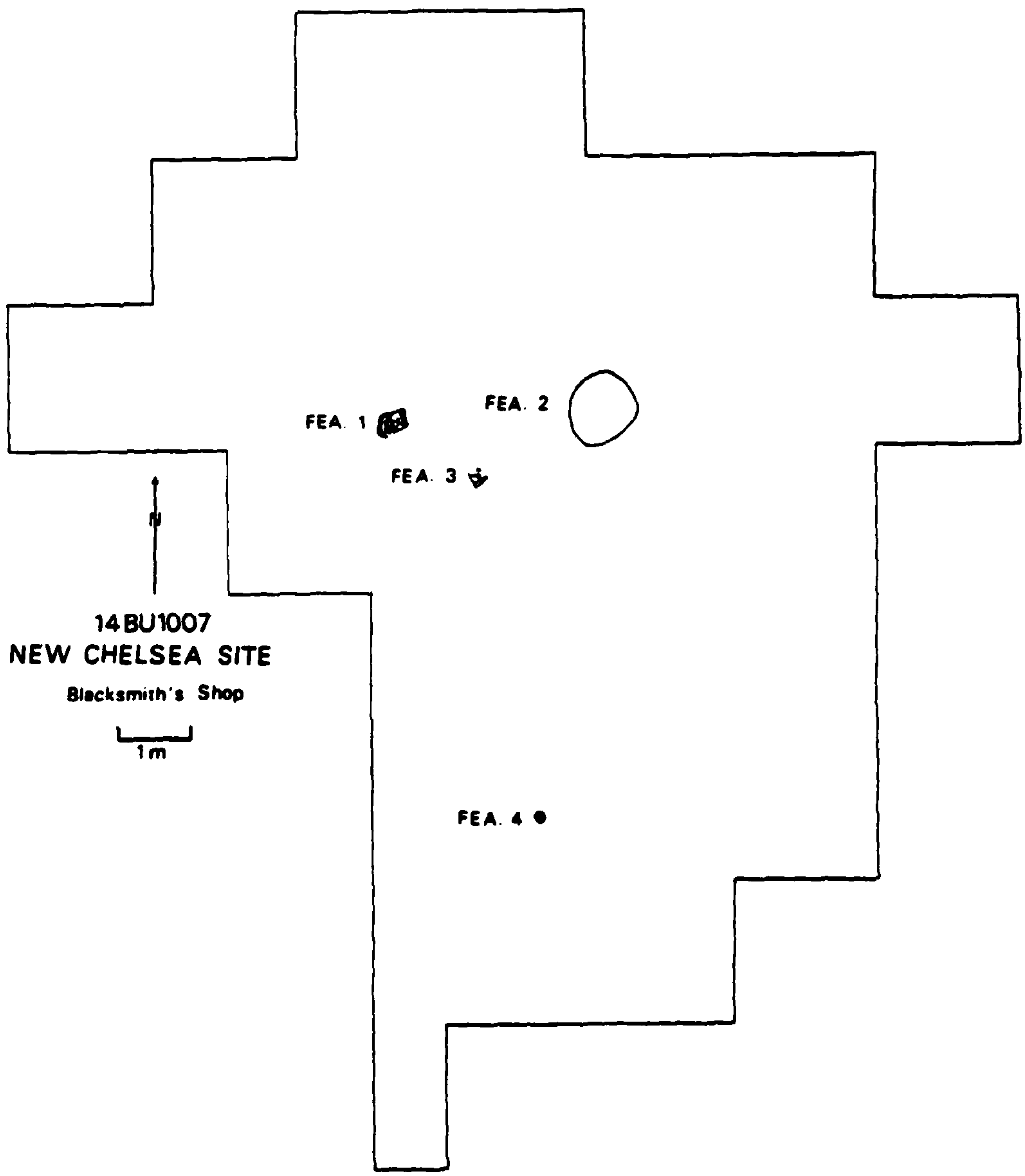


Figure 1.10. Index of subsurface data transects, El Dorado Lake Project; use with Table 1.3.



FEA. 1
FEA. 2
FEA. 3
N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
FEA. 4

Figure 10.5.

Table 1.3. Data for Figure 1.10.

This table provides explanatory information for Figure 1.10. The heavy numbered and/or lettered lines indicate locations of transects or clusters of drill holes. Distances between holes are highly variable, and not all holes extend to bedrock. Paired letters (A-A', etc.) indicate cross sections across alluvium which have been drawn and studied. Areas marked by t are remnants of the Pleistocene T-1 terrace (see also Fig. 1.3). The lines depicting the valley boundaries delimit the alluvium (both Pleistocene and Holocene). The following data briefly describe the numbered transects and lettered cross sections:

1. Kansas Turnpike
2. New railroad alignment
3. Old railroad alignment
4. Kansas Highway 13
5. Borrow pit
6. Borrow pits just upstream from new dam
7. New dam transect and other nearby drill holes
8. New dam overflow area
9. Recreation area access roads

A-A' Kansas Geological Survey transect

B-B' Kansas Geological Survey transect

C-C' Durechen Creek bridge portion of the Kansas Highway 13 transect

D-D' Walnut River portion of the new railroad alignment transect

E-E' Kansas Geological Survey transect

F-F' Kansas Geological Survey transect

G-G' Kansas Geological Survey transect; parallel to and just south of the Snyder Site (14BU9)

H-H' Kansas Geological Survey transect

I-I' Kansas Geological Survey transect

J-J' Lake El Dorado Dam

K-K' Lake Bluestem Dam

L-L' Straightest-line portion of the new dam transect

Figure 10.6. Feature 1, brick and limestone concentration.

Discussion

Although the experimental studies failed to produce the hoped for subsurface maps, the time and efforts involved were not a waste. In addition to the concept of the value of such maps to archeology, and an outline of the necessary procedure leading to the construction of the maps, other knowledge has been gained as well. While we do not have the maps, we do know a great deal more about the subsurface conditions than we otherwise would, had not this data been used: (1) we cannot separate the lower alluvium from the upper alluvium on a valley-wide basis, but we can now do so at a number of places; (2) the drill holes have made it feasible to select certain locations where it might be more productive to put in test trenches than by strict trial and error; (3) now known regolith depths have given great perspective on the general limits of archeological possibilities, and show how slightly these possibilities have been tapped; (4) bedrock configuration is not known overall, but it is now known fairly well in some places.

In order to salvage as much information as possible from the drill hole records, several cross sections were made for areas where the holes transect alluvium (see Figures 1.11-13; cross sections are indexed on Fig. 1.10). The vertical scale is the same for each cross section to make comparisons easier, and all but two have the same horizontal scale. Both scales are in feet. The upper line represents the surface of the regolith, and the bottom line the surface of the bedrock.

Several geomorphic characteristics and relations can be seen on these profiles. The general flatness of the floodplains, and the varying thicknesses of the alluvium are obvious features, as is the essential parallelism of the alluvium to the bedrock in most cases. The parallelism along the main dam axis (L-L') is astounding, and it appears to lesser degrees in A-A', D-D', I-I', and K-K'. Steepness of the bedrock troughs at valley edges is apparent in C-C', E-E', J-J', K-K', and L-L', and of special interest is that this steepness falls only on the south sides of the three major local tributaries of the Walnut River. These are Durechen Creek (C-C'), Satchel Creek (J-J'), and Bemis Creek (K-K'). At the north ends of these transects are remnants of the red T-1 terrace, which does not occur on the south where it is clear that erosion has been strongest (see Fig. 1.3). Why this cutting pattern exists is uncertain, but it may relate to Late Quaternary uplift which has tilted the underlying structure and shifted the east-west trending streams to the south sides of their valleys.

Stream channel cutting into bedrock is clear in profiles D-D' and L-L', and less defined in C-C' and K-K' where lateral planing of the bedrock seems the case. The L-L' profile is interesting because time differentials between stream actions stand out. To the left, the older Walnut River is seen to have in the past become entrenched in bedrock, whereas on the right the younger tributary, Bemis Creek, has not left a bedrock channel, but has laterally planed the bedrock without cutting very deeply into it. Bedrock erosion by tributary streams also shows that the tributaries were in existence prior to the deposition of the lower alluvium. Again, for the Bemis Creek portion of the L-L' profile, T-1 terrace

being present in what is undoubtedly a blacksmith shop and the evidence of prolonged heat (chalky limestone and hard, baked-out soil) without any signs of direct burning. The interpretation is supported by the relative sparseness of artifacts around the feature (see distribution maps under ARTIFACTS) - a smith had to maintain a debris free working area around his forge.

The forge itself was probably mortared brick resting on the unconsolidated limestone. Assuming that the foundation remnant is indicative of the feature's original size it can be estimated at the forge had a minimum diameter of approximately 40 cm. Considering the amount of disturbance to which the feature has been subjected, a forge diameter of 1.5 feet or approximately 46 cm, would not be unrealistic. Typical height for a general purpose forge was 20-22 inches (50-56 cm) (Richardson 1978 (3):39). It cannot be determined from the evidence on hand whether the forge was round or square. Several small pieces of metal with mortar adhering suggest that metal parts were incorporated in the forge, possibly a blower or other aid. A forge of this size was large enough to maintain the four to five inch fire-pit used by a smith. The baked out soil around the feature indicates that fairly high temperatures were maintained for extended periods of time, but also reveals that the forge was inefficient, allowing heat to escape through the brick and limestone and into the surrounding soil.

Feature 2 was a truncated, basin shaped, clay-filled pit east of Feature 1 (Fig. 10.7). It was basically circular in plan view with a maximum diameter of 1.05 m. In profile, it had a maximum thickness of 13.5 cm. The feature was first recognized as a dark, organic looking stain with clay mottling. A quantity of clinkers were recovered directly over and in the upper centimeters of the feature. During cross sectioning, it was noted that the clay mottling became more pronounced and that only small fragments of artifacts were recovered below the 20 cm level.

This feature is interpreted as a clinker pit, an area primarily used for the disposal of forge cleaning debris. Its original ground surface diameter is estimated at approximately 1.5 m. The clay in the pit and its size suggest that it may once have been used to store or mix clay as in ceramic manufacturing. It was earlier postulated that the forge bricks were locally produced, thus this pit may have been used in their manufacture.

Feature 3 was a limestone filled pit one meter southeast of Feature 1 (Fig. 10.8). Along its longest axis it measured 39 cm. This feature extended to a depth similar to that of Feature 1, but unlike the latter, constricted so that it had a cone shaped profile. A few fragments of miscellaneous iron were recovered among the field stones that comprised the feature, but there was no brick.

Due to its proximity to the postulated forge, Feature 1, and the relative lack of debris associated with it, Feature 3 is interpreted as the foundation for the blacksmith's anvil. The anvil had to be situated so that the smith could move easily along an arc between it and the forge while close enough that the metal would not cool in the interim. Most likely, the anvil itself was rooted to a large timber block. Such a block was often anchored in the ground, sometimes as much as three feet (Hogg

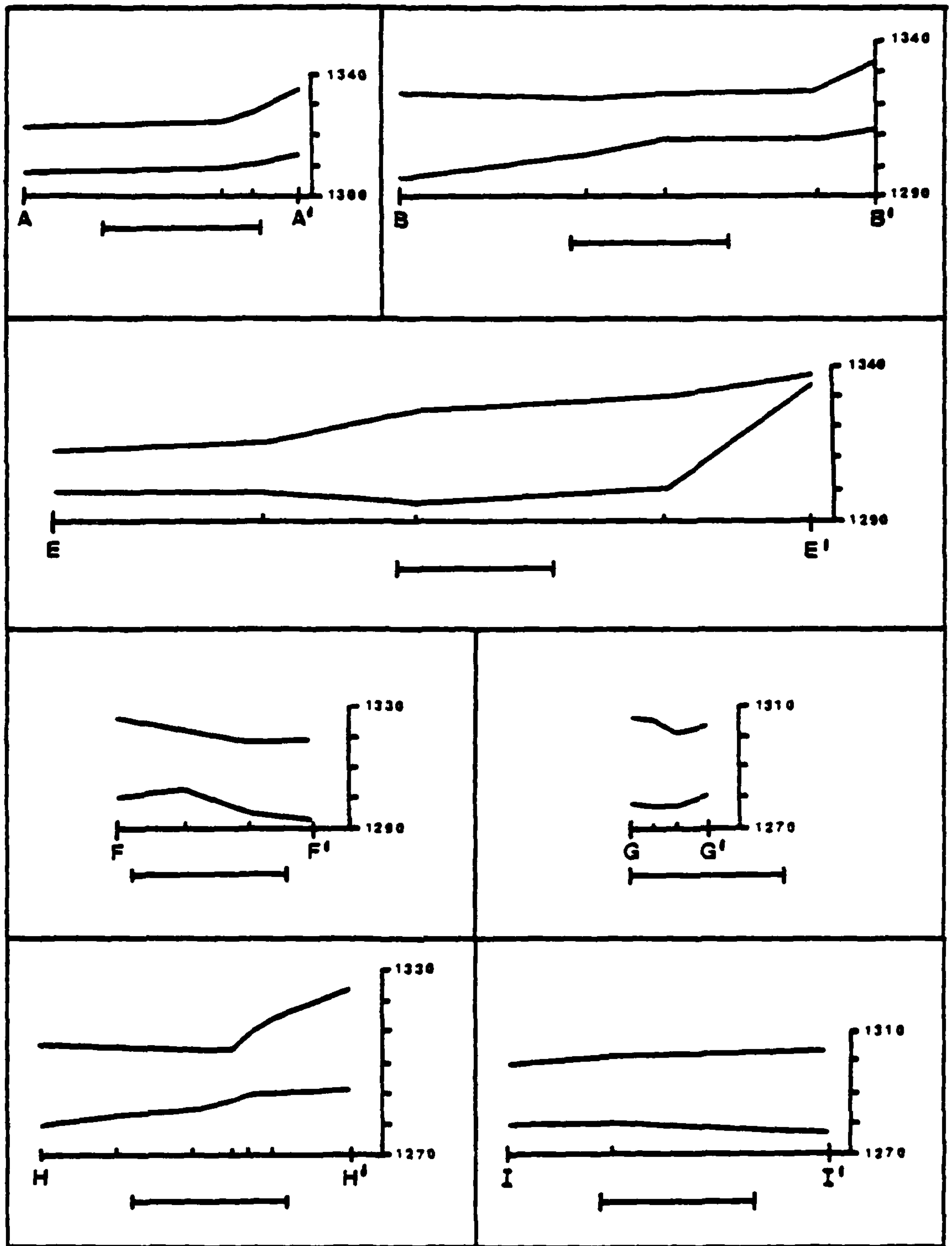


Figure 1.11. Valley cross sections, El Dorado Lake project; see Figure 1.10 and Table 1.3; 1"=50' vertically; 1"=1000' horizontally.

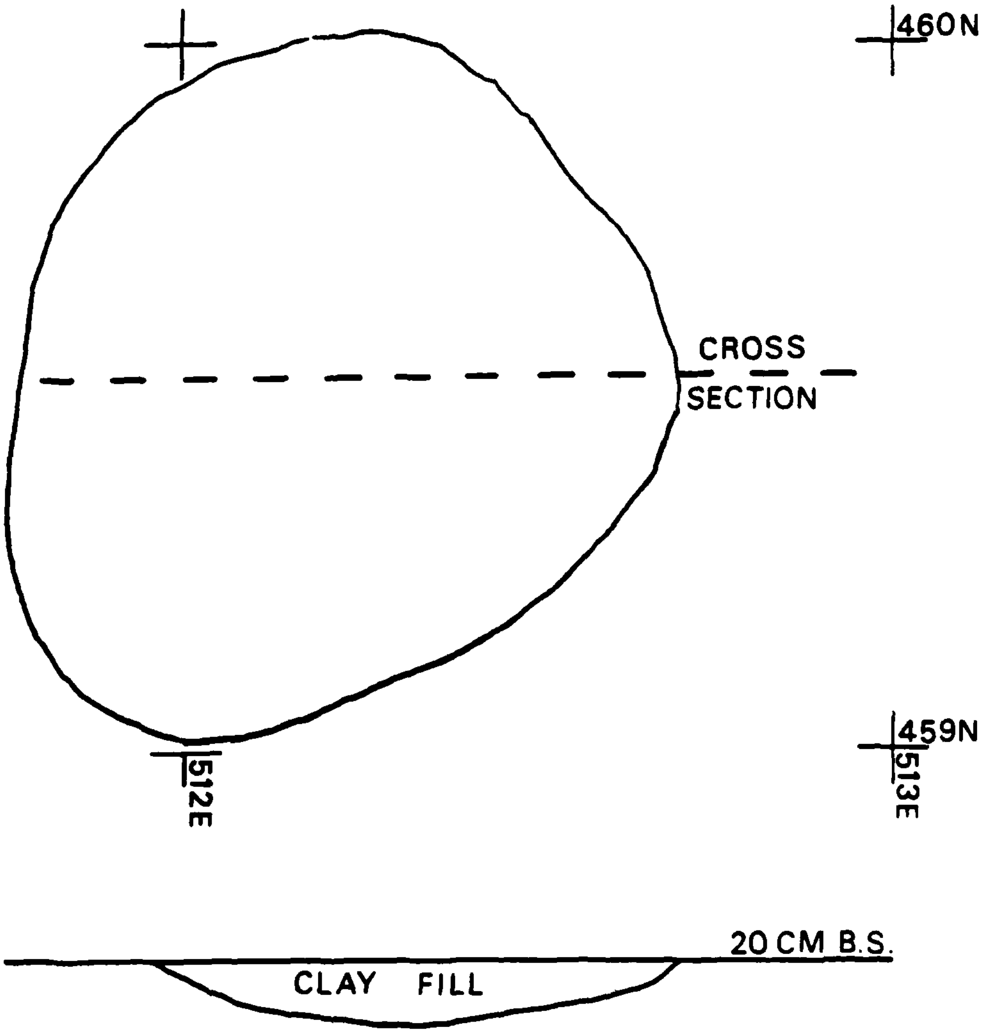


Figure 10.7. Feature 2. clay-filled clinker pit. Planview, top; cross-section, bottom.

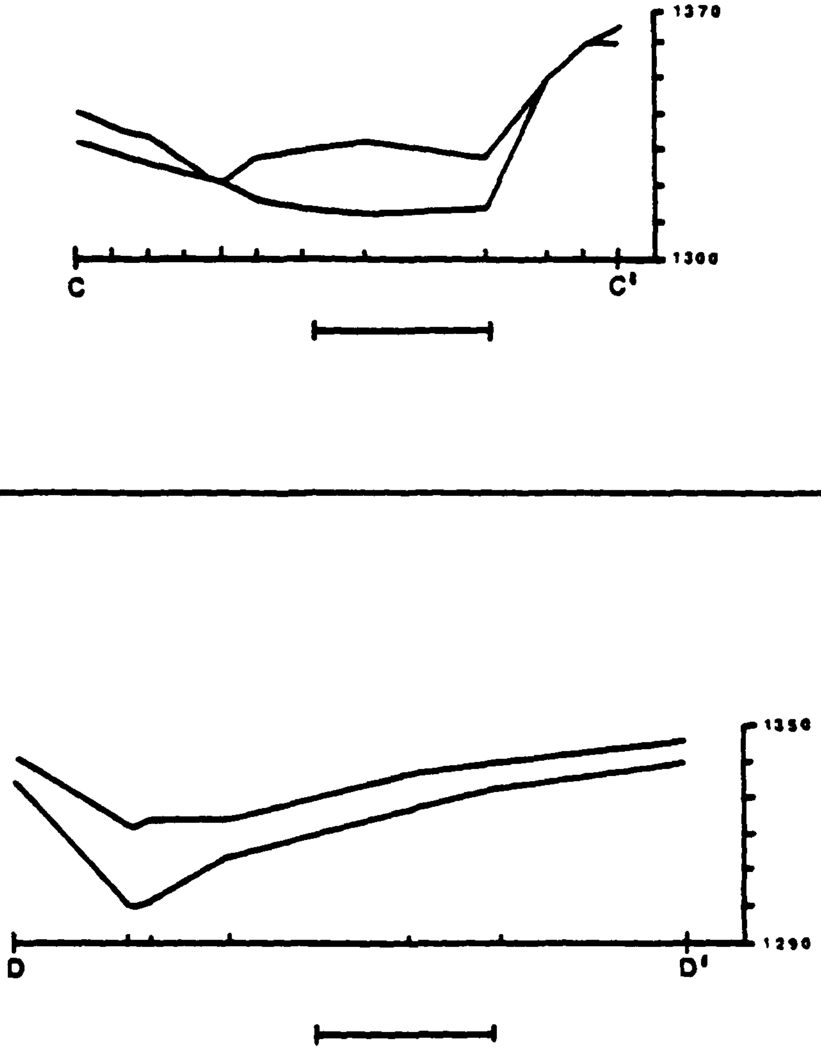


Figure 1.12. Valley cross sections, El Dorado Lake project; see Figure 1.10 and Table 1.3; 1"=50' vertically; horizontally 1"=1000' (C-C') and 1"=2000' (D-D').

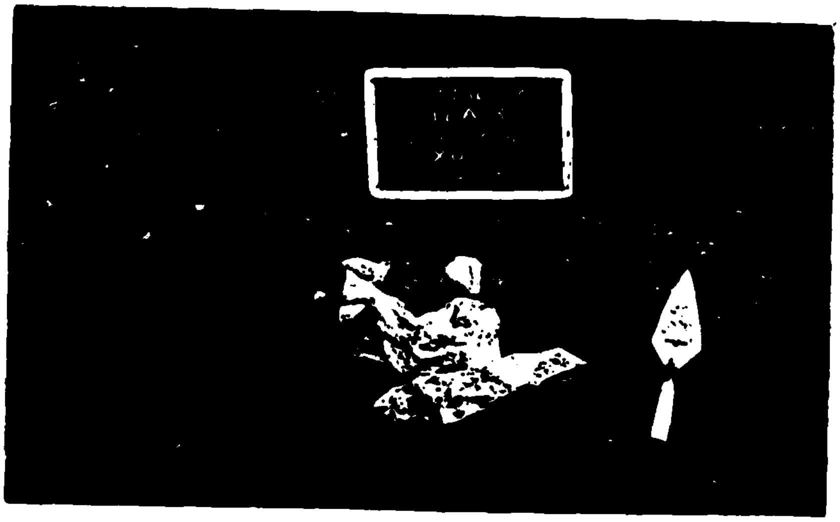


Figure 10.8. Feature 3, limestone-filled pit.

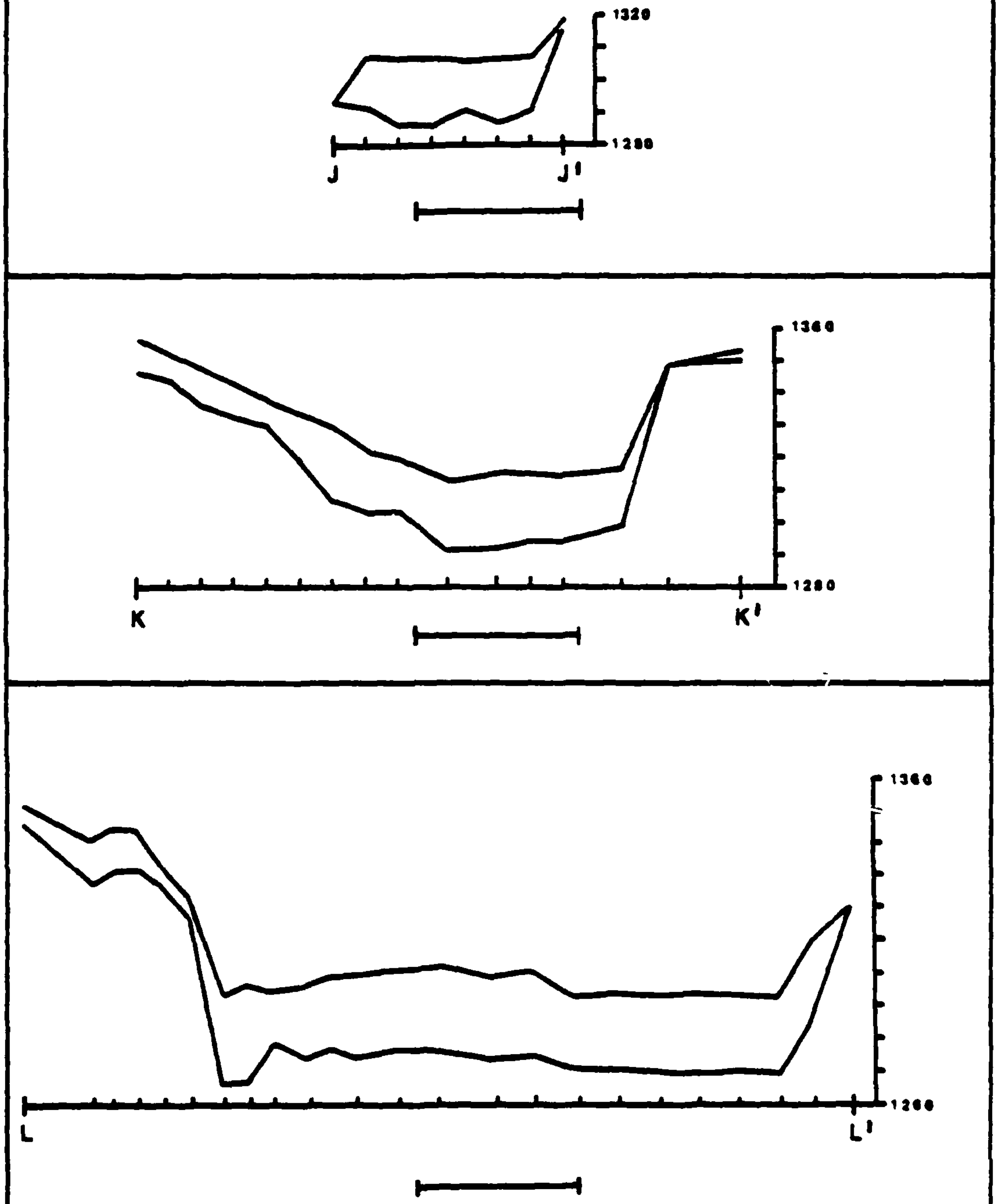


Figure 1.13. Valley cross sections, El Dorado Lake project; see Figure 1.10 and Table 1.3; 1"=50' vertically; horizontally 1"=1000' (J-J' and K-K') and 1"=2000' (L-L').

1964:43). In this instance limestone replaced a portion of the block. It is possible that Feature 3 was originally 50 cm or more in diameter, thus making it capable of supporting a massive block. The limestone would have helped maintain a constant height for the anvil by preventing the repeated blows from driving it into the ground.

Another possible interpretation is that Feature 3 represents a bosh, a source of water in which hot metal is doused or quenched for tempering (Hogg 1964:32-3). The poor permeability of the Ladysmith soil into which the pit was dug would allow water to stand for extended periods of time. The presence of limestone in the pit can be explained by an old blacksmith's belief that dousing in limewater helps strengthen a metal's temper (Dr. Leland Miller, amateur blacksmith, personal communication). This explanation is discounted for several reasons: (1) using a pit as a bosh risks soil contaminating the hot metal; (2) even though the soil has a low permeability, such a pit would require more frequent replenishing than the more typical tub or trough; (3) a ground level pit at this distance from the forge would be awkward for the smith; and (4) such a pit would be too shallow.

Feature 4 was a circular stain in the southern portion of the excavation. It had a diameter of 18 cm but a depth of only 4 cm below the plowzone. A large fragment of brick was recovered in association with Feature 4. Although originally thought to be a post stain, the shallowness of the feature prevents any cultural interpretations.

Artifacts

The artifacts recovered during the excavation of the blacksmith shop reflect the wide range of activities associated with such an important industrial enterprise. By identifying the various tools' distributions it is possible to learn how this blacksmith organized his work behavior.

In exploring an historic site, particularly a late 19th century site, the importance of the individual artifact is sometimes subjugated in favor of emphasizing the class or assemblage of which it is a part. Most of the tools and other artifacts recovered are similar if not identical to their modern counterparts. Few exhibit any attributes useful in determining chronology or place of origin. Unlike prehistoric artifacts where detailed descriptions are necessary to justify classifications, a name generally suffices to identify an historic tool. None of the artifacts recovered are so far removed from modern material culture as to be unrecognizable when identified by name. Therefore, this section will emphasize assemblages. Two types of assemblages will be used: activity sets (tool assemblages used in specific work behaviors such as metal working, woodworking, farrier, etc.) and use sets (assemblages comprised of artifacts that can be used for similar functions in different activities, i.e., nails, nuts and bolts, bottles, etc.). The distribution of these assemblages will be illustrated and discussed and constituent artifacts will be identified.

It is important to note that few complete artifacts were recovered. Over 95% of the excavated items are fragments. Therefore, counts may be misleading. Where possible minimal numbers will be discussed.

remnants are on the north side, but not on the south, and the south trough edge is steep.

Profiles E-E' and G-G' show seemingly anomalous rises of the bedrock towards the Walnut River. This may possibly indicate channel shifts over time. That is, the river may have meandered back and forth over a certain area for a time planing the bedrock, and then shifted to current positions.

Bedrock terraces exist in profiles A-A' (not clear here), B-B', F-F', H-H', and K-K'. In A-A' and H-H' these terraces exercise bedrock control on the surface expression of the regolith where edges of the T-1 terrace correspond to the edges of the bedrock terraces. The statement in the paleogeographic model (Drew 1981) that said there was no bedrock control for the T-1 scarp at H-H' is in error.

One final observation is that in profile E-E' there is a considerable thinning of alluvium towards the Walnut River. Very little of this can be accounted for by the slight differential in bedrock surface topography. The thin area is generally upper alluvium while the thick area is a remnant of the lower red alluvium which comes to the surface as T-1 terrace. The thinning could be the result of simply less deposition here or recent surface erosion, but more likely it is a function of the two major geologic units at a point of abutment.

Conclusions

Although the available data proved to be inadequate for the goals of the experimental studies, and a certain disappointment inevitably exists, it is considered to have been a worthwhile venture. Eventual success was tenuous from the beginning. The attempt to come up with the subsurface maps envisioned, which could provide both basic geomorphic data and predictive models useful for buried archeological site discovery, admittedly may have been somewhat foolhardy. However, the data was abundant and seemed to warrant the try, if for no other reason than to put the materials to work doing something. That has been accomplished, and while maps did not result, a great deal of useful information did. The derivation of the cross sections alone justify the labor involved. Also, while marvelous predictive models were not forthcoming, delineation of culture-bearing units is much better understood because of the attempt.

Above all, it is hoped that the methods and goals discussed here may be useful to others as an example of what ought to be striven for. It is truly believed that the subsurface mapping approach to locating buried archeological sites could be of significance. It could be rewarding, especially if enough good data exists or can be easily supplemented by the well thought out placement of a limited number of additional drill holes. If this is not feasible (for one reason or another) and drilling equipment is available, at least a minimum number of selected cross sections are recommended.

The predictability of site locations as to specific geologic units would be particularly useful in large salvage operations (such as El

Flat Glass

A total of 104 fragments of flat glass were recovered, 57 and 47 from levels 1 and 2, respectively. Most of these fragments probably represent window glass although several colored fragments are most likely from panel bottles (Table 10.1).

Walker (1971) has suggested that window glass thickness can be used as a chronological indicator. His comparative data indicates that window glass produced after 1845 is 4/64" (1.59 mm) or greater in thickness. By excluding the three colored fragments from level 2, a total of 44 possible window glass fragments remain, of which 81.8% (36) are greater than or equal to 4/64" in thickness. The flat glass correctly indicates a post-1845 occupation.

Table 10.1. Flat glass color.

Color	Counts Level 1	Level 2
Amber	3	1
Aqua	1	2
Clear	21	18
Green Tint	32	26
	57	47

There are three discernable areas of flat glass occurrence (Fig. 10.9): the north-central units, south-central units, and Feature 2. Although the number of contiguous units comprising these areas of "concentration" is not as large as in other artifact classes, an inspection of the distribution map clearly shows their presence. Each concentration consists of clear and green tinted glass only. The colored specimens occur outside the concentrations.

Although flat glass appears in most of the portions of the excavation, it occurs most frequently in the eastern units. An arbitrary line passing through the east-west midpoint places 72% (34) of the flat glass specimens in the east half. A north-south division does not show as distinct a variation, revealing 57% (27) of the pieces are in the southern units.

The presence of flat glass is problematical. There is no evidence for a structure, which questions the designation of window glass. However, the fragments may well have originated from carriage windows. Most of the pieces were recovered from the east half of the excavation, which is believed to be primarily a disposal area. This suggests that most were discarded. Therefore, these fragments may represent discarded carriage panes.

Dorado) where recovery time is a major overall factor. If the first step in such a project would be to define the limits of the culture-bearing units, it is likely that more sites could be found, and in far less time, and that they would represent a much longer chronology. Without such subsurface information, these large scale operations inevitably become almost exclusively concerned with surface and/or near subsurface sites, and thus with only an extremely small portion of the total possible record, which may then be lost forever.

Acknowledgements

Sincere appreciation is extended to the following persons who assisted, in one way or another, with the research that preceded this report: Virgil Burgat and Avery Garton, Kansas Department of Transportation, Topeka, Kansas; Don Brison, Bill Johnson, and Gary Koontz, Kansas Department of Transportation, El Dorado, Kansas; Dr. William Hambleton, Howard O'Conner, Barbara (Vis) Stanley, and Mark Ziegler, Kansas Geological Survey, Lawrence, Kansas; Tom Hensley, U.S. Army Corps of Engineers, El Dorado, Kansas; Louis Lynch, caretaker of lakes, El Dorado, Kansas; Joe Llewellan, farmer, El Dorado, Kansas; Dr. Wakefield Dort and Paul Kopsick, Department of Geology, University of Kansas; Dr. Paul Brockington, Dr. Alfred Johnson, and Ken Wilcox, Museum of Anthropology, University of Kansas.

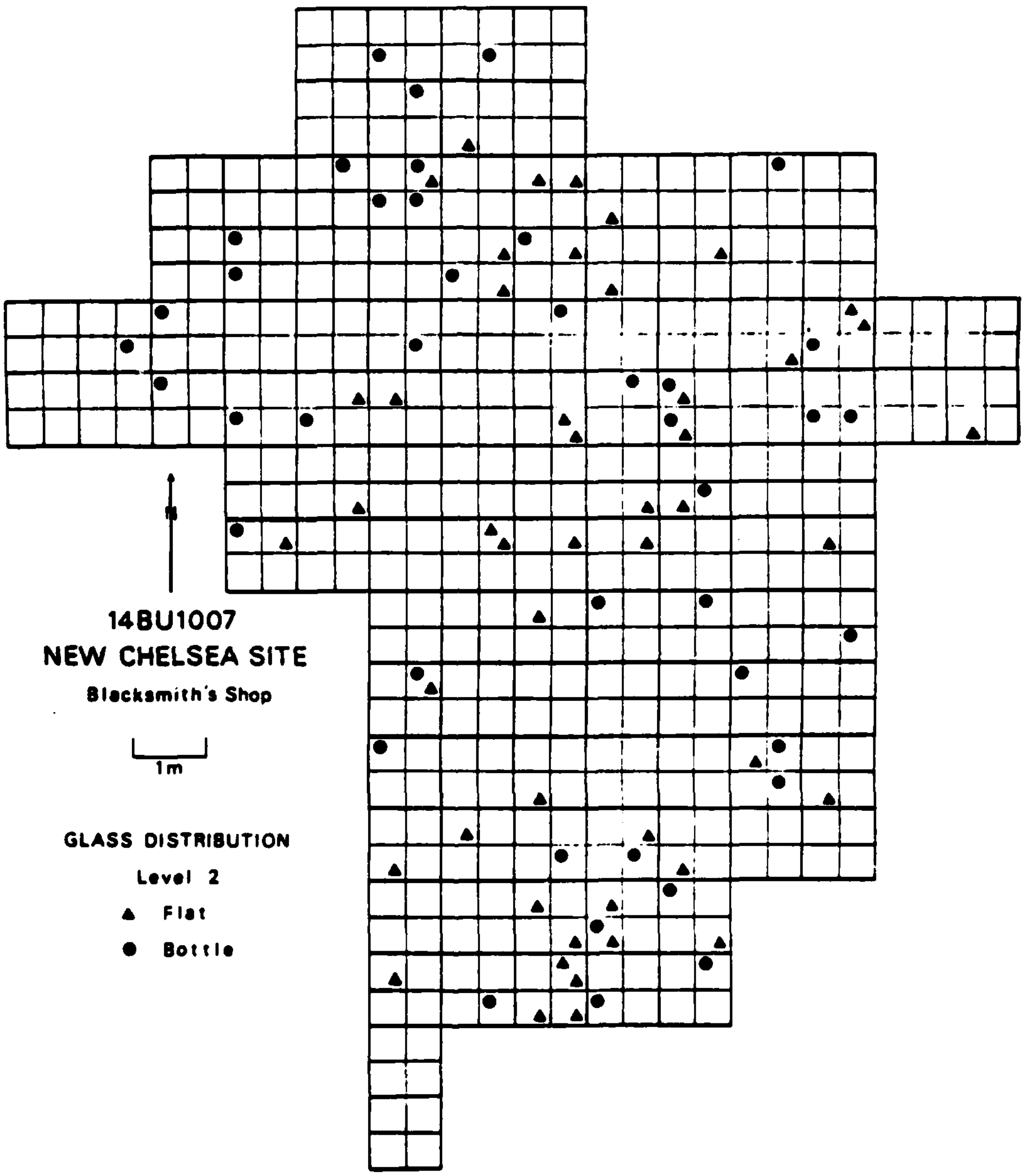

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
GLASS DISTRIBUTION
Level 2
Flat
Bottle

Figure 10.9.

Bottle Glass

A total of 97 bottle fragments were recovered, 55 and 42 from levels 1 and 2 respectively. Aqua colored fragments comprise 42.8% (18) of the level 2 assemblage, followed by clear, sea green, amber, green tinted, and light manganese or amethyst (Table 10.2).

Table 10.2. Bottle glass color.

Color	Level 1	Level 2
Amber	8	4
Aqua	26	18
Clear	7	7
Green Tint	5	4
Light Amethyst	5	2
Sea Green	4	7
	55	42

Three specimens, all aqua colored, bear fragments of embossed labels. The three are an "-OD P-", "INC", and an "o" or "c". It is possible that the "-OD P-" is a fragment of the words "blood purifier." The style of the lettering resembles that on a "LYDIA E. PINKHAM'S BLOOD PURIFIER" bottle illustrated in Baldwin (1973:389). It should be noted that another Pinkham product was recovered at 14BU1008, not far from this site (see Brown, this volume). Pinkham's products were common in the latter decades of the 19th Century and were available in the area; this may be an additional specimen. The other fragments are unidentifiable.

Only one bottle neck was recovered from level 2. It is a light ame-

However, it is possible that the pipe was lost or discarded by a visitor (a blacksmith shop was often a favorite gathering place for townsmen). The distribution map of the five level 2 specimens shows that all occur in probable refuse areas (Fig. 10.10). Ceramics from the blacksmith shop and their significance are more fully discussed by Anderson (this volume).

Table 10.3. Ceramics.

Type	Counts Level 1	Counts Level 2
Earthenware		
Unglazed/Unglazed	1	
Ironstone		
White glazed	3	2
Semi-porcelain		1
Stoneware		
Albany/Albany		1
Tan/Albany	1	
Yellow/Brown		
Glazed Smoking Pipe	1	
Pipe Stem		1
	6	5

Blacksmith Tools

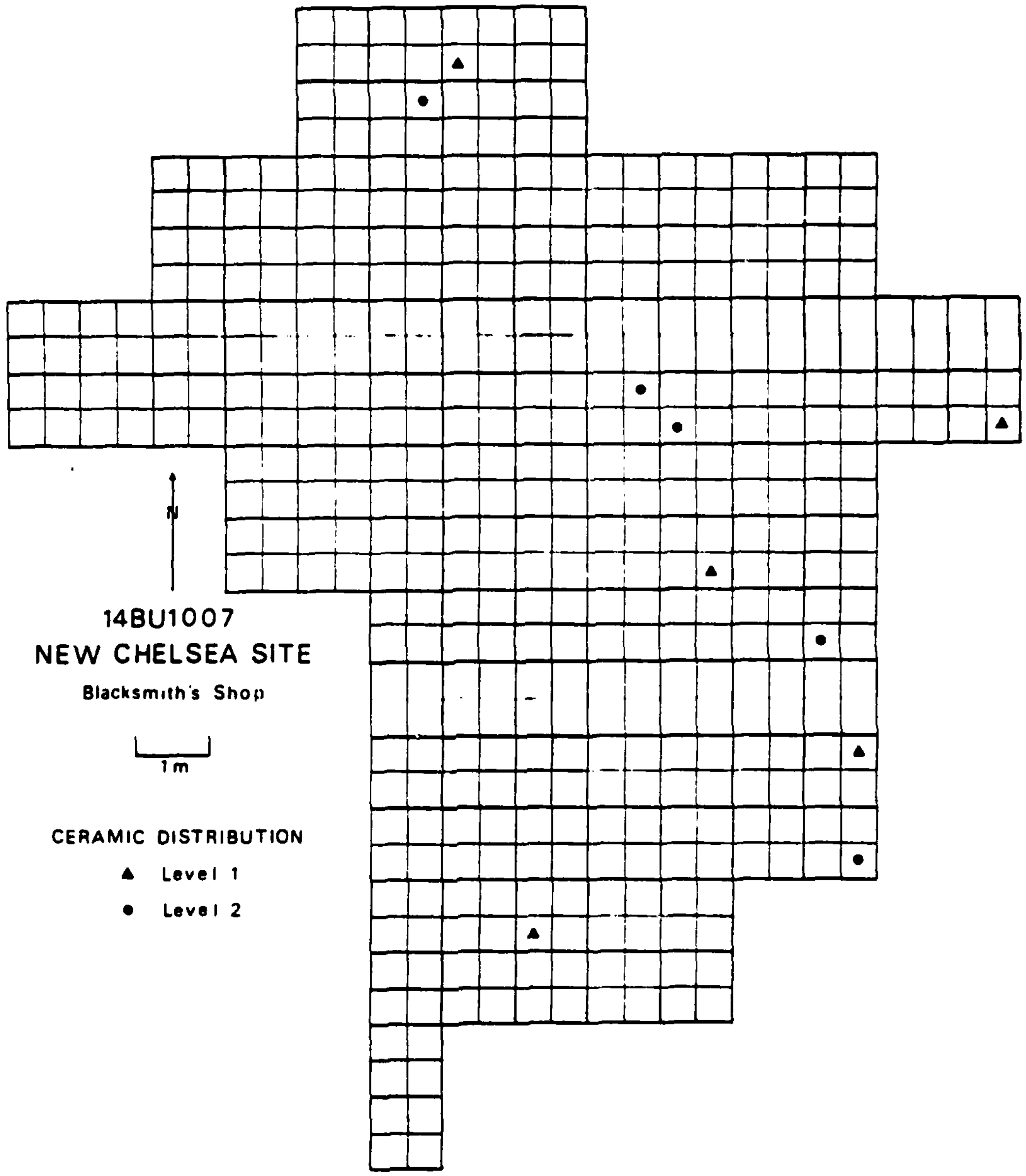

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1 m
CERAMIC DISTRIBUTION
Level 1
Level 2

Figure 10.10.

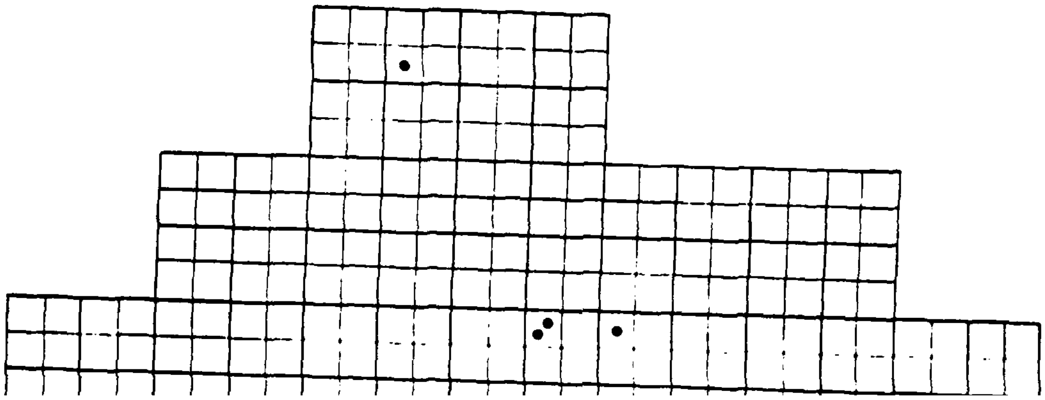


Table 10.4. Blacksmith tools.

Type	Counts Level 1	Level 2
Chisel	4	3
Cotter Pin		1
Eye	1	
File	1	
Fuller	1	
Gear	1	
Handle Insert	2	
Heading Tool	1	
Needle	1	
Pin		1
Pliers	1	
Punch	2	2
Screwdriver	1	3
Socket	1	
Tang	2	1
Toe Calk	2	1
Tongs	1	
Tool Head	2	2
Washer	1	1
Wedge		3
Wrench		3
	25	21

reworked the body into another chisel or adapted it to another function. It should be emphasized that no tool bodies were identified in the assemblage.

A significant member of this assemblage is A97181410001, a fragment of a large cast-iron gear (Fig. 10.12). Wear on the teeth indicates that the piece moved counter-clockwise. Curvature in two directions indicates that the gear was mounted with its teeth at an angle to the ground. It had a bowl shaped interior with an interior orifice just one inch from the teeth. Spivey (1979:179) shows a post drill with gears similar to this one. This fragment is the only evidence recovered for tools other than simple, handheld implements.

Blacksmith Miscellany

This assemblage includes the "raw materials" used by a smith and the detritus of his work. Table 10.5 provides the distribution by level of the "raw materials" or stock pieces - iron bar, rod, specialized bar, and sheet or plate iron. This is the material that a smith used every day in his manufacturing and repairing. As can be seen, the most common materials are the standard bar and rod in varying widths and thicknesses that a smith purchased in lengths of multiple feet from his supplier. The specialized bar probably represents the material not generally kept on hand but

assigned 14BU4's buried component to that taxonomic unit. The contemporaneity of the two deposits was further suggested by similarities of soil stratigraphy at each site (Fulmer 1976:47, and below).

Intensive surface reconnaissance was conducted at 14BU4 by University of Kansas survey crews in 1977. The frequent thunderstorms of that summer provided optimal conditions for surface collection, and large samples were recovered. The southern and northern areas of the site were more precisely defined and found to represent spatially discrete clusters of debris. Materials from the two areas were kept separate to provide provenience control for surface samples from the site (Root 1978:2-3). Samples from the northern area yielded side-notched, corner-notched, and unnotched projectile point forms and cord-marked ceramics, while the southern area yielded unnotched and corner-notched points and a single cord-marked sherd. Root (1978:3) found no conclusive evidence in this diverse array of systematically recovered artifacts to identify a Plains Village occupation in the southern area, as stated by Eoff and Johnson (1968).

Phase III Fieldwork

Goals

Previous investigations at 14BU4 suggested three problems on which Phase III work focused. These problems and the methods used to retrieve data for their resolution, are as follows:

(1) obtain a precise, quantified delimitation of the northern and southern site areas, using a gridded surface collection,

(2) determine the state of preservation and behavioral significance of the surface component's uninvestigated southern area, by conducting controlled subsurface excavations, and

(3) determine the lateral extent and internal spatial structure of the buried Late Archaic deposit, by a strategy of backhoe trench exploration and subsequent controlled block excavation.

In addition to these goals, soils and geomorphology of the site were investigated as a means of determining the environmental context of prehistoric occupations.

Field Procedures

Six weeks in the summer of 1979 were available for the accomplishment of these goals, with a crew of seven persons, including the author as field director. The areas excavated during that time are shown on the site map, Figure 2.2.

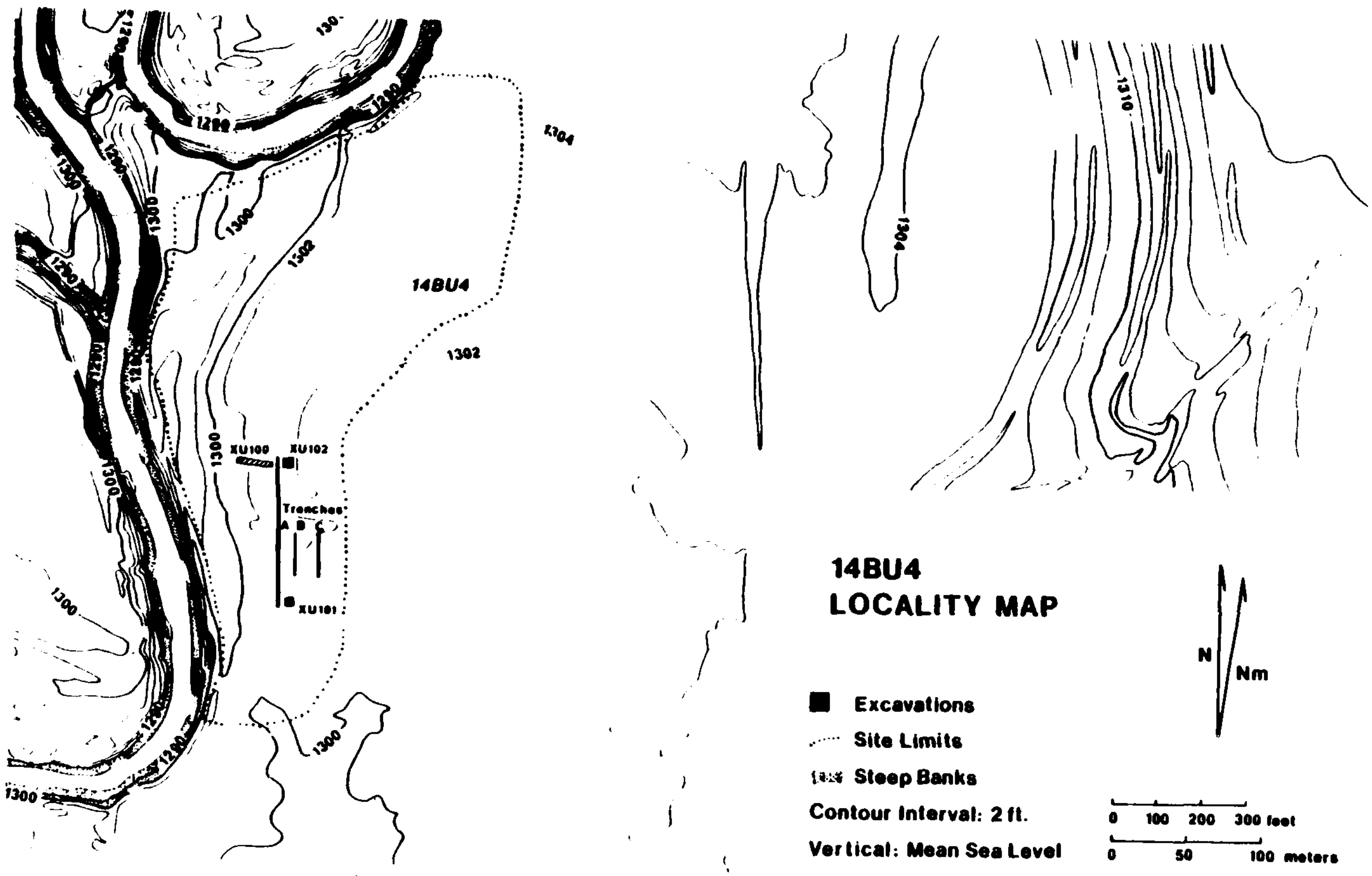


Figure 2.2. Site map, 14BU4.

For provenience control, an arbitrary reference point was established in the southern area of the site, designated N500 E500 in a Cartesian coordinate system. Grid coordinates (in meters) increased with distance north and east of the reference point, and decreased to the south and west

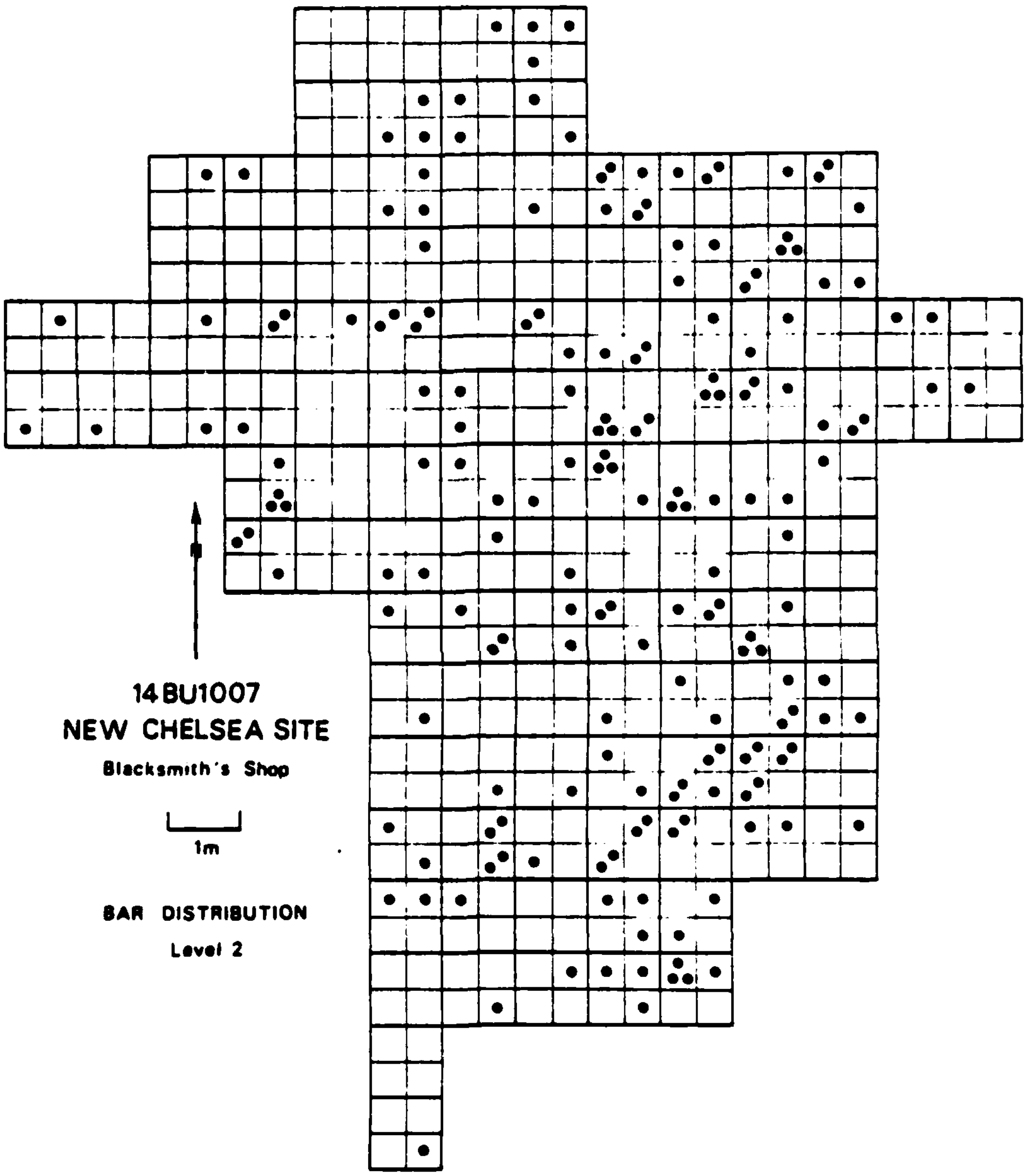

14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
BAR DISTRIBUTION
Level 2

Figure 10.13.

excessively wet. Conditions were judged to be excellent for surface collection.

Excavation of backhoe trenches resulted in the location of only one area of deeply-buried cultural material. Fourteen specimens of chert chipping debris were recovered in a 30 cm. thick stratum, between N589 and N595 in Trench A. XU102 was established immediately east of Trench A to excavate this stratum. Excavation of XU102 began with the opening of a six m. trench of three two by two m. squares along the east wall of Trench A between N592 and N598. The surficial Woodland component was excavated by shovel scraping, screening all soil and bagging material from two m. squares. Time limitations precluded tighter provenience control. A 20 cm. plowzone level (Level 1) and one 10 cm. sub-plowzone level (Level 2) were sufficient to penetrate the Woodland deposit. Each two m. square was then shoveled rapidly to a depth of 1.25 m. BS. At approximately 1.15 BS, small amounts of chipping debris were encountered. Between 1.25 and 1.35 BS (Level 4), more material was encountered and it was decided that 1.25 m. of overburden could be removed without significant loss of Archaic material. A backhoe was employed to remove overburden to this depth from an eight by 10 m. area defined by grid lines N590, N600, E500, and E508. Within this area, a six by six m. block was established, with sides along N592, N598, E500, and E506. As shown in Figure 3, this left a two m. wide bench on the north, east and south of the six by six m. block. This allowed easy access to the block, provided workers with elbow room, and eliminated the hazard of wall collapse in the deep excavation. Overburden removal was designated Level 3.

The six by six m. area was shovel scraped to a level of 2.05 m. BD (1.25 m. BS). Four 10 cm. levels (Levels 4-8) were then excavated from the six by six m. block. Details of excavation procedures are provided below. At 2.45 m. BD (1.65 BS), artifact densities had decreased to the point that the cultural deposit was judged to be exhausted. A two by two m. test pit, in the southeast corner of XU102 was shovel scraped to a depth of 3.25 m. BD (2.45 m. BS), but failed to provide evidence of other deeply buried archaeological deposits.

XU103 was placed in proximity to a concentration of chert flakes which were noted in the Trench A backdirt pile following a rainstorm. The excavation tested the possibility that these flakes were derived from an undetected buried deposit hit by the backhoe. Overburden was removed by backhoe from a three by three m. area, defined by grid lines N509, N512, E502, and E505. From this depth, excavations were continued by hand within a two m. square centered within the three m. square. Seven 10 cm. levels were shovel scraped and screened to a depth of 2.85 m. BD (1.75 m. BS) without recovering cultural material.

At the conclusion of the 1979 season, profiles of the west walls of XU101 and XU102 were drawn and soil samples were collected from XU102 and Backhoe Trench C. As required by the El Dorado Lake project scope or work, all excavations were backfilled.

Table 2.1 summarizes the techniques employed in excavations of XU101, 102 and 103. Techniques varied according to the purpose of the excavations.

eastern half. Most of the pieces are distributed around Feature 2 and in the southeast units. There is also a quantity of material in the northeast. Specialized bar, sheet iron, and plugs conform to the bar distribution (Fig. 10.14).

Rod fragments represent a small dispersed class of artifact (Fig. 10. 15). There are no apparent concentrations. The most interesting apsect of the rod distribution is that much of the material occurs in the central area which contains little other material. The significance of this occurrence has yet to be assessed.

Clinkers occur throughout the excavation and, as noted in an earlier section, provide the clearest picture of the differential disturbance between levels 1 and 2 (Figs. 10.16 and 10.17). In level 2 there are three noticeably dense areas of material: (1) a concentration of small amounts in the northwest; (2) an accumulation of larger amounts of material in the southeastern units with an extension up the eastern periphery; and (3) the heaviest concentration directly over and within a one meter radius of Feature 2. However, in level 1, clinkers are randomly distributed.

Using the quantity of material present in level 2 as a guide, it is postulated that Feature 2 and the southeastern portion of the site were primary disposal areas for clinkers. The material extending up the eastern periphery probably represents a minor accumulation spreading from the southeast through a gradual shift in disposal patterns, purposeful and non-purposeful spreading actions by humans, and agricultural disturbance. There may have been some overlap between Feature 2 and the southeastern disposal area.

The material in the northwest may represent a primary disposal area. However, it would have been an area either used sparingly or not used until the latter part of the occupation.

Miscellaneous iron occurs throughout the excavation (Fig. 10.18). Its distribution clearly indicates primary disposal areas in the southeast portion of the site and around Feature 2. More than any other class of artifact, the miscellaneous iron class indicates an overlapping of Feature 2 and the southeastern disposal area. There is a dispersed area of relatively smaller quantities of iron (compared to the amounts in Feature 2 and the southeast) in the northernmost units of the site. In conjunction with other artifact distributions, this may indicate a smaller, less frequently used, disposal area.

Another small concentration of miscellaneous iron is located directly south of Feature 1, the postulated forge. The concentration occurs in between Feature 1 and Feature 3 and may be related to the activities that occurred around these features. This suggests that Feature 3 may be the anvil foundation and the small fragments of metal are the detritus of metal working that accumulated even though the area was cleaned.

With the exception of the small concentration between Features 1 and 3, the miscellaneous iron distribution indicates a relatively clean central area. The area runs roughly northwest to southeast and appears to extend more towards the west than the east.

XU101 and the deep levels of XU102 were intended to provide data on internal structure of the archaeological deposits. Therefore, provenience control was maximized in these units. Excavations were conducted in one m. squares, using 10 cm. levels (with the exception of XU101's 20 cm. plowzone level). Further detail on internal structure was provided by plotting three dimensionally all artifacts two cm. or larger in maximum dimension. All soil from these units was screened through ¼ inch mesh.

The plowzone level of XU101 and the low-density areas of the deeply buried levels of XU102 were shovel scraped. Troweling was employed in the removal of fragile organic remains such as bone and charcoal, which would otherwise have been destroyed. The abundance of bone in the sub-plowzone levels of XU101 resulted in the exclusive use of trowels in these levels to maximize recovery. In addition, the floors of all completed provenience units were troweled to check for cultural features and soil changes.

Half bushel (17.5 liter) flotation samples were taken from each level. A systematic sample spacing was achieved by dividing each level into two by two m. quadrants, and consistently taking flotation samples from the NE ¼ of the SW ¼ of each quadrant. This resulted in four samples per level from XU101, three samples per level from the upper component levels of XU102, and nine samples per level from the lower levels of XU102. Plowzone levels were not sampled. Samples were collected in labeled plastic bags and air-dried before processing in a pump driven flotation device.

The surface levels of XU102 (Levels 1-2) were shovel scraped. Material was bagged by two m. square, and no three-dimensional plotting was carried out. All soil was screened through ¼ inch mesh, and flotation samples were taken.

The deep two by two m. test pits in XU101 and XU103 were excavated by shovel scraping, with the exception of two 30 cm. thick levels of XU101 (Levels 5 and 6, 50 to 1.10 m. BS) which were excavated rapidly with shovels to reach the predicted levels of Archaic strata on the site.

Each excavator made a field record of each excavated level as it was completed. These notes recorded soil conditions, soil disturbances, and the kinds and quantities of archaeological materials recovered, including the coordinates and identification of plotted artifacts.

Soil-Geomorphic Relationships

Soil stratigraphy at 14BU4 was recorded in 1979 in XU101 (Figure 2.3 above), XU102 (Figure 2.4) and in the three backhoe trenches (Figure 2.5). In addition, soil stratigraphy in XU100, the 1974 test trench, is shown in Figure 2.6, as recorded by Fulmer (1976). The sequence of soils observed in all exposures except the easternment backhoe trench (Trench C) consists of an upper soil, developed beneath the modern surface, overlying a buried paleosol, which was encountered at depths of 50 to 70 cm. beneath the low berm at the terrace edge.

The major horizons of the soil sequence, based on a detailed examination of the XU102 profile (Figure 2.4), are described below. Terminology

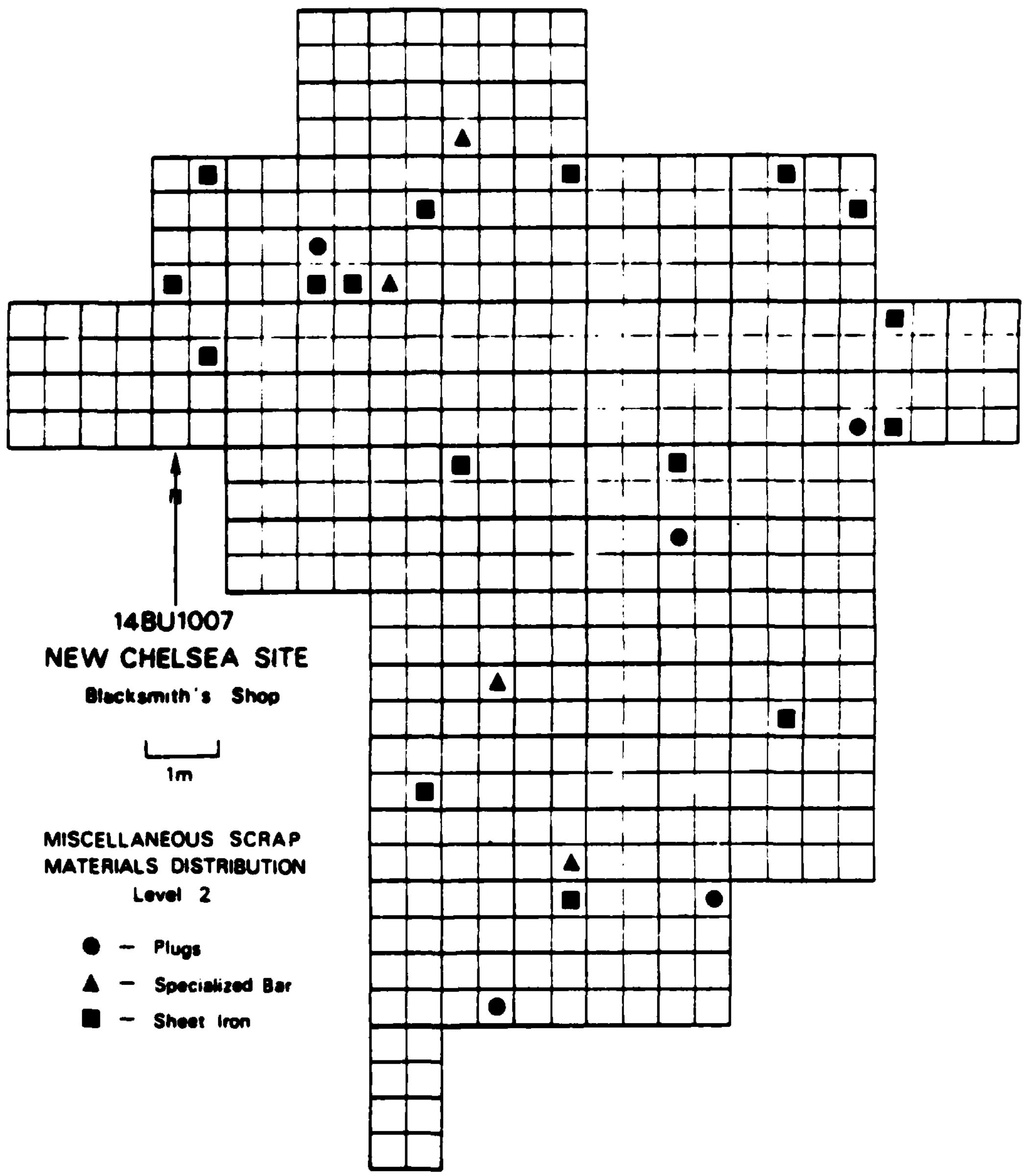

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
MISCELLANEOUS SCRAP
MATERIALS DISTRIBUTION
Level 2
● — Plugs
▲ — Specialized Bar
■ — Sheet Iron

Figure 10.14.

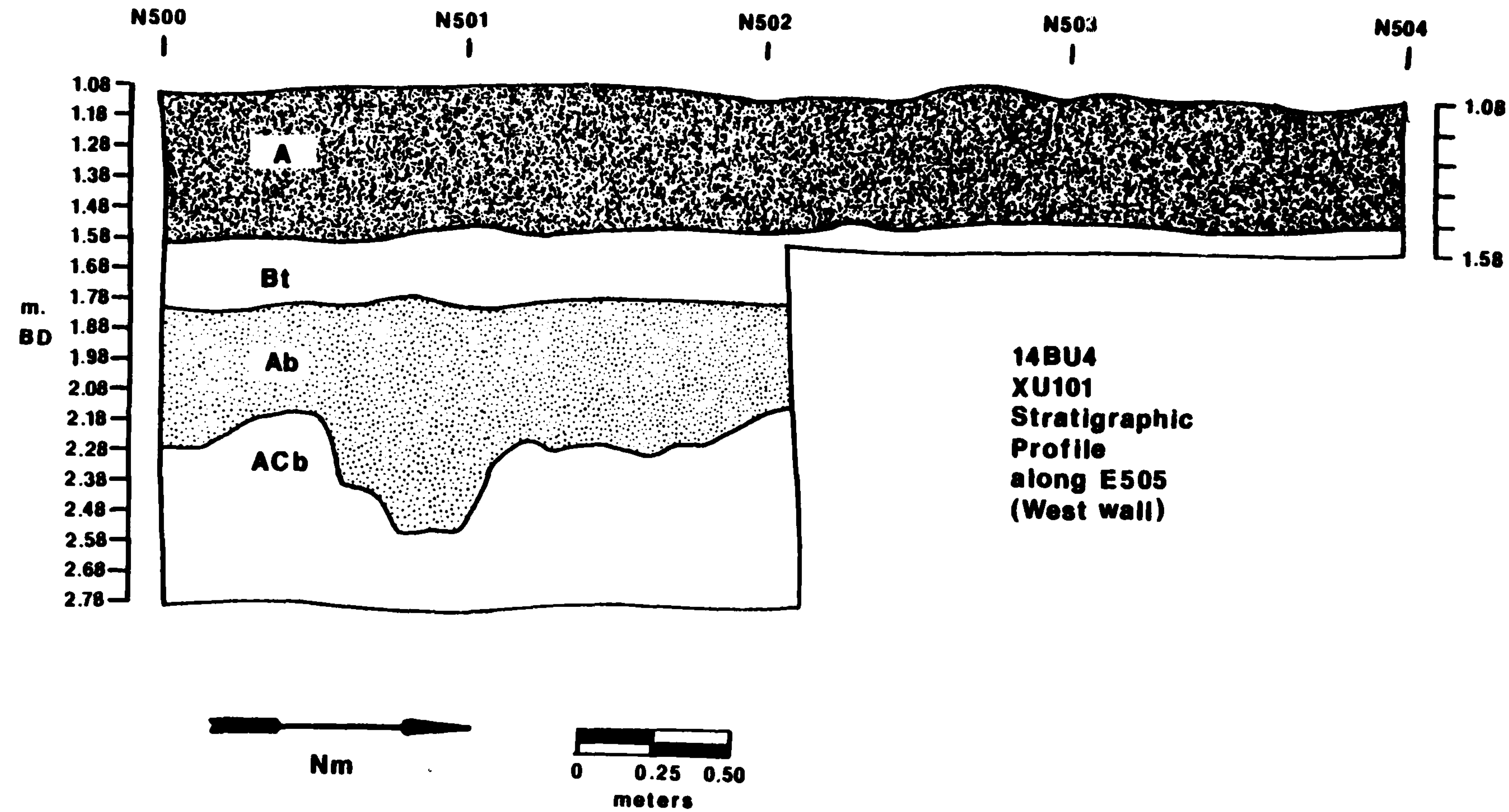


Figure 2.3. Stratigraphic profile of XU101, 14BU4.

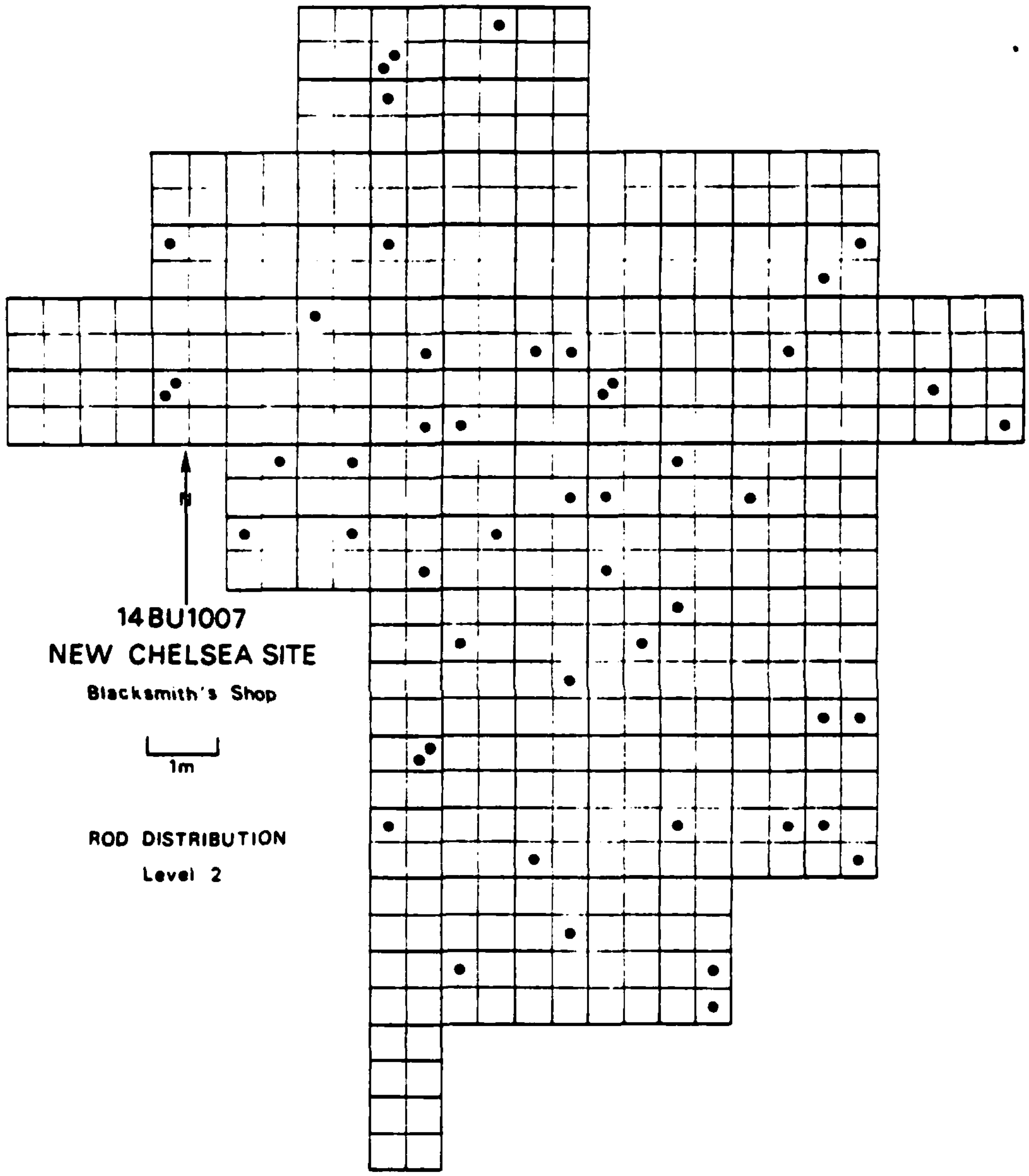

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
ROD DISTRIBUTION
Level 2

Figure 10.15.

Table 2.1. Summary of excavation procedures employed at 14BU4.

	XU101 Surface	XU101 deep test	XU102 Surface	XU102 deep levels	XU103 deep test
Size in m.	4 x 4	2 x 2	2 x 6	6 x 6	2 x 2
Depth excavated (cm. BS)	0-50	50-170	0-30	125-165	115-175
Horizontal Proveni- ence units (m)	1 x 1	2 x 2	2 x 2	1 x 1	2 x 2
Vertical Provenience levels	Level 1:20 cm. Lev. 2-4:10 cm.	Lev. 5-6:30 cm. Lev. 7-12:10 cm.	Lev. 1:20 cm. Lev. 2:10 cm.	All levels: 10 cm.	All levels: 10 cm.
Excavation Methods:					
Shovel scrape	Level 1 only	Lev. 7-12	All levels	All levels	All levels
Trowel	Lev. 2-4	Floors, walls	Floors, walls, fragile material	Floors, walls, fragile material	Floors, walls
Collection Procedure					
Plot (>2 cm.)	Yes	No	No	Yes	No
Screening	All levels	Levels 9-12	All levels	All levels	Levels 2-7
Method of over- burden removal	-	Shovel	-	Backhoe	Backhoe
Flotation samples	Yes	No	Yes	Yes	No

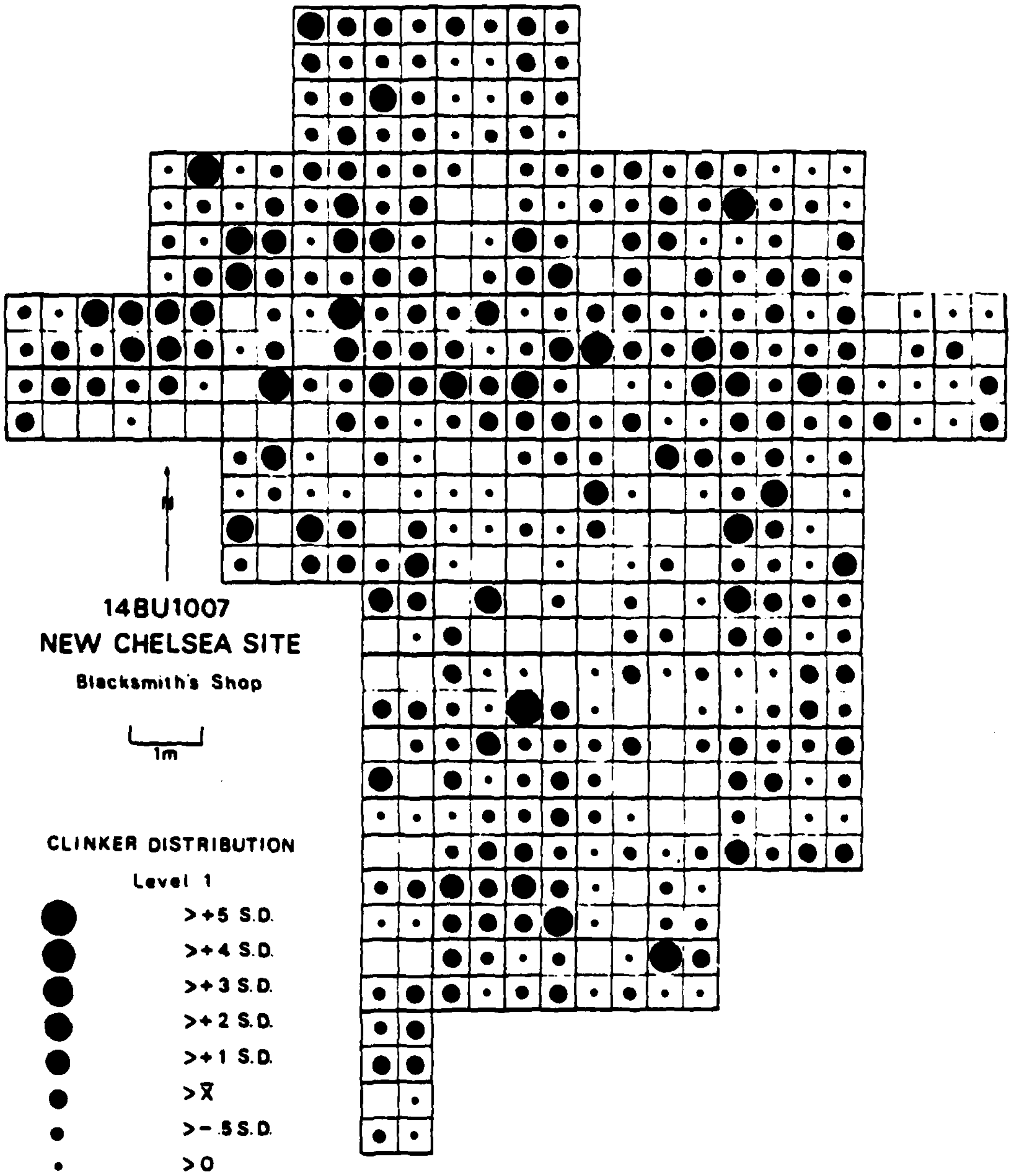

14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
CLINKER DISTRIBUTION
Level 1
>+5 S.D.
>+4 S.D.
>+3 S.D.
>+2 S.D.
>+1 S.D.
>X̄
>-.5 S.D.
>0

Figure 10.16.

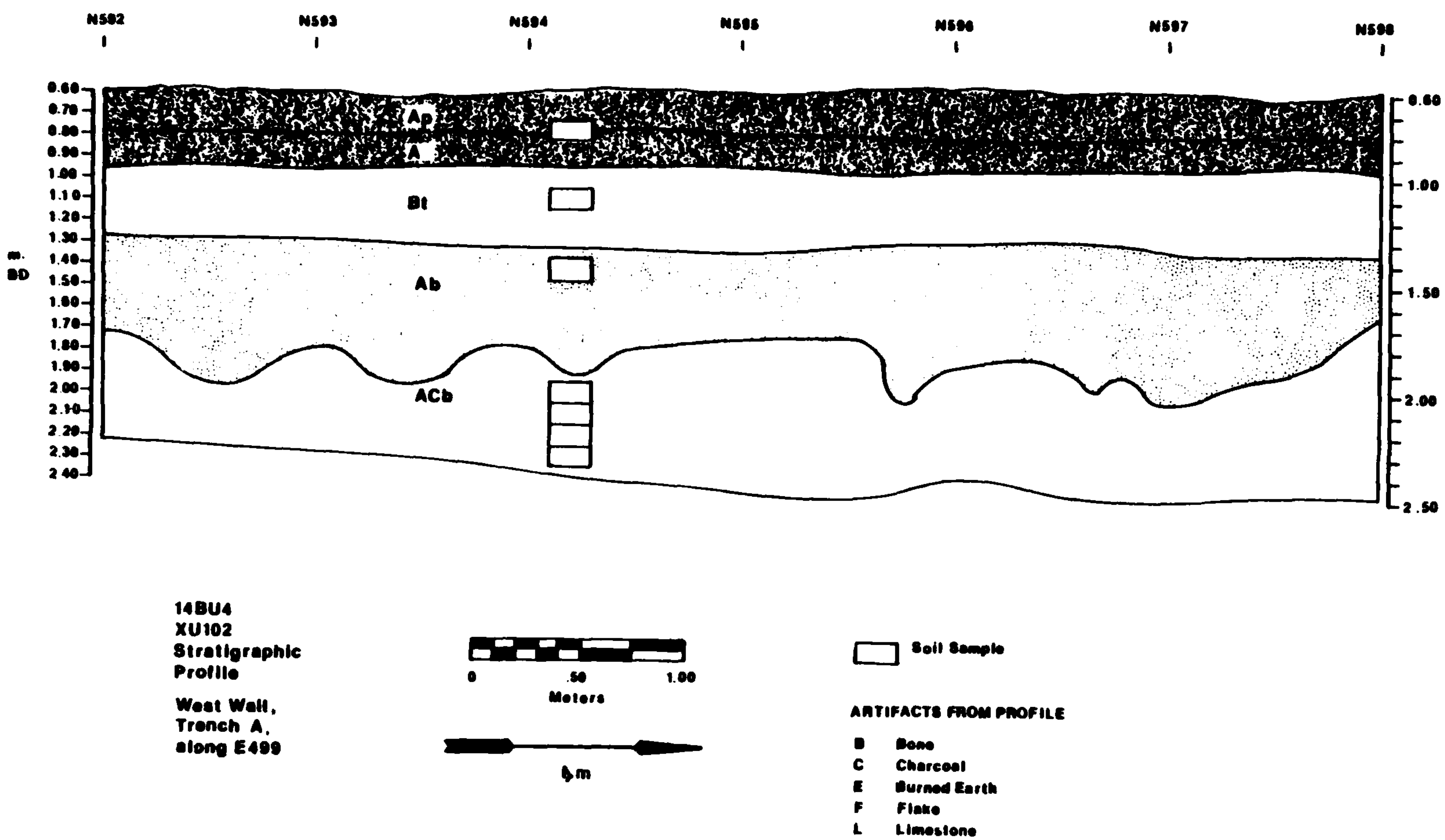
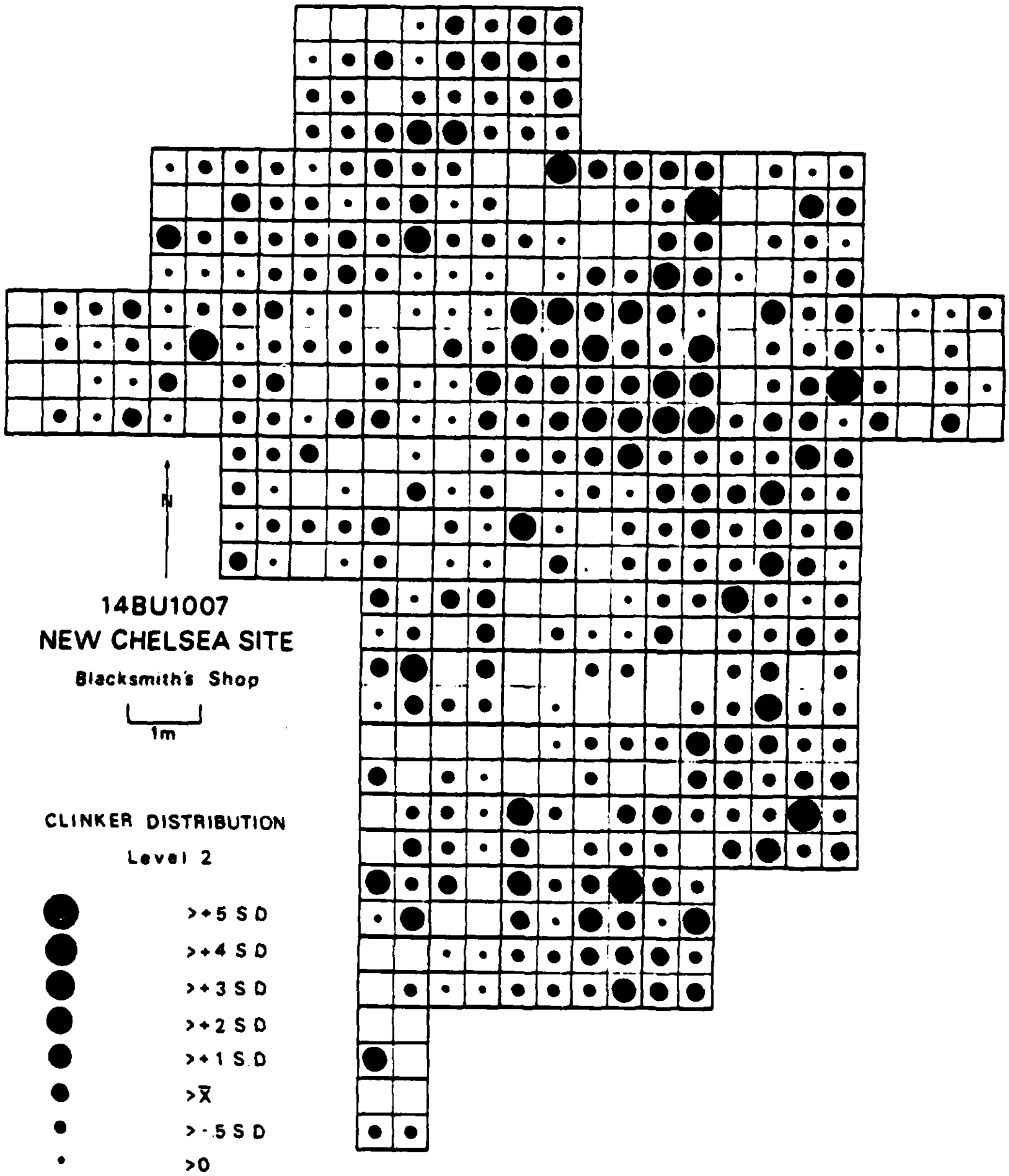


Figure 2.4. Soil stratigraphy, XU102, 14BU4.



N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
CLINKER DISTRIBUTION
Level 2
>+5 S D
>+4 S D
>+3 S D
>+2 S D
>+1 S D
>X̄
>-.5 S D
>0

Figure 10.17.

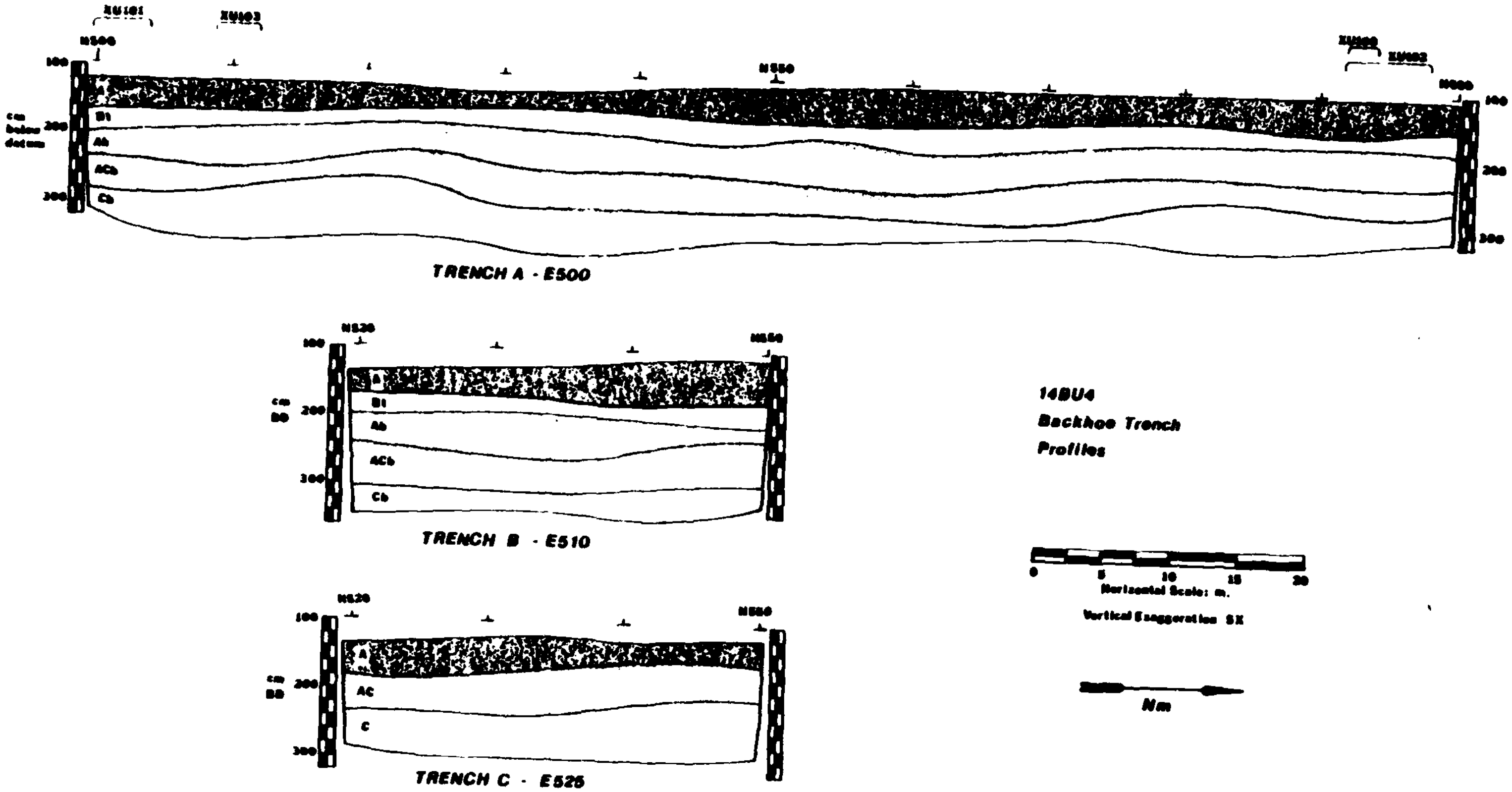


Figure 2.5. Backhoe trench profiles.

Farrier Artifacts

Farrier refers to horseshoeing. The farrier assemblage is comprised of horseshoe nails (138) and horseshoe fragments (14). Only a few specialized tools aside from the smith's normal implements were necessary to shoe horses. Because farrier tools could not be distinguished from others, they are included in the blacksmith tool assemblage.

Shoeing horses was probably the single most important function of a blacksmith in the American west. It was a job that required considerable skill, as each shoe on each horse had to be individually fitted. A small error could ruin a shoe or horse or both. Horseshoes were generally good for only six months and so it was not uncommon for the professional farrier to carry the measurements of his regular customers in his head. The short lifespan for shoes also insured a fairly steady work source for the smith.

Horseshoes could be made by the smith from bar or rod, or blanks could be purchased from suppliers (cf. Spivery 1979). The same is true for nails. In this blacksmith shop, all the recovered horseshoe nails are common cut, which means they were produced by machine. The shoes, however, appear to be handmade with a four-three pattern, i.w., four holes on one side and three on the other (Fig. 10.19b). Several of the horseshoe fragments from levels 1 and 2 were being modified when they broke or were discarded (Fig. 10.19c). One specimen, A97111110002 (Fig. 10.19a), has been rounded on one end from use. What purpose it was adapted for cannot be determined, but it may have been farrier related.

None of the horseshoe fragments are sufficiently complete to accurately estimate size. The largest was possibly five inches from toe flange to heel calk; the smallest, three to four.

Distribution maps for horseshoe nails and horseshoe fragments are presented in Figures 10.20 and 10.21. One of the most unique aspects of the horseshoe nail distribution is that it is mutually exclusive of other square nails (see Square Nails). Both types of nails are present in the southern units, but most of the contiguous quadrants with horseshoe nails are in the west half, while regular square nails predominate in the central and eastern units. Horseshoe nails form an arc through the units north of Feature 2 while the other types tend to occur in units northwest of the feature.

The degree of spatial separation between the two major types of nails is probably related to function. Horseshoe nails and other nails are not used simultaneously and therefore would be disposed of separately. Disposal would take place within the general boundaries of the disposal areas but the specific focus of discard would be unique to each event.

Horseshoe fragments are a small, dispersed class of artifact. The sample size and nature of the distribution preclude any statements about clusters. It can be noted, though, that 79% (11) of the specimens occur south of Feature 1. Given the large number of horseshoe nails and bar fragments (the latter most likely include some horseshoe tips) in the southern portion of the excavation, the horseshoe fragment distribution suggests that farrier activities were conducted in that area.

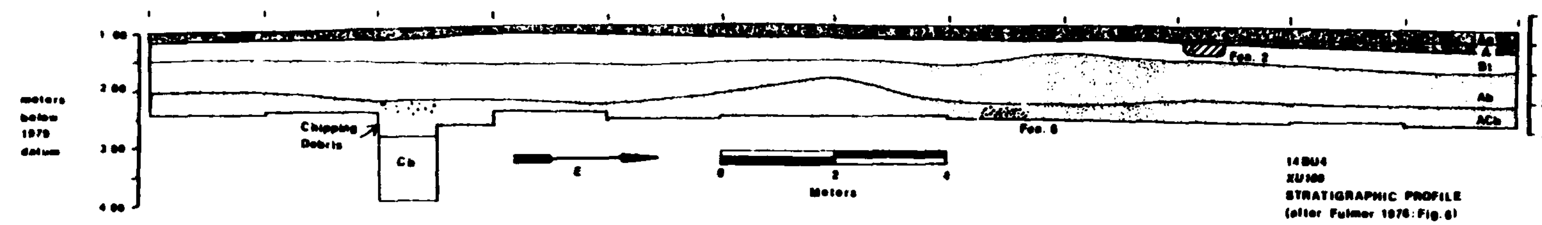


Figure 2.6. Stratigraphic profile of XU100, the 1974 test trench.

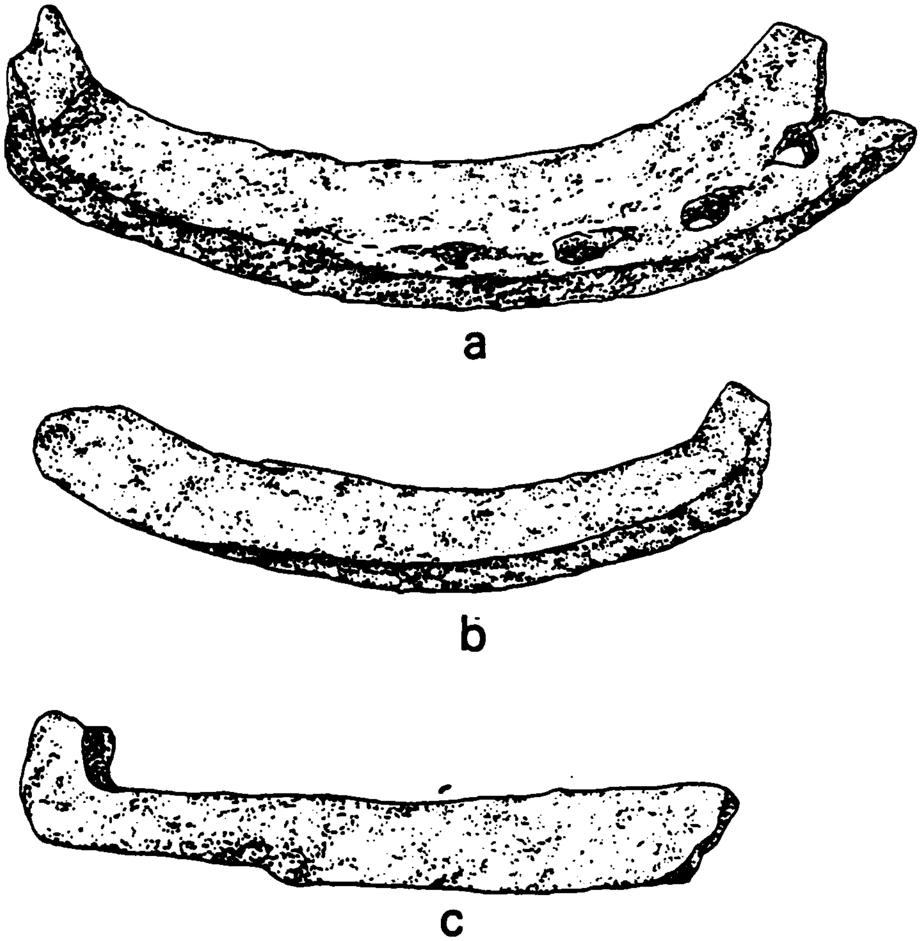


Figure 10.19. Farrier related artifacts: a. A97091410001, horseshoe fragment; b. A97111110002, horseshoe fragment modified for use as a tool; c. A97201 220003, horseshoe fragment, partially pounded flat. Actual size.

follows that of the Soil Survey Staff (1975).

SOIL PROFILE, 14BU4, XU102

Ap	0-20 cm.	Very dark grayish brown (10YR 3/2) silt loam; granular structure, slightly acid; smooth abrupt boundary.
A	20-35 cm.	Very dark grayish brown (10YR 3/2) silt loam; subangular blocky structure; slightly acid; smooth, gradual boundary.

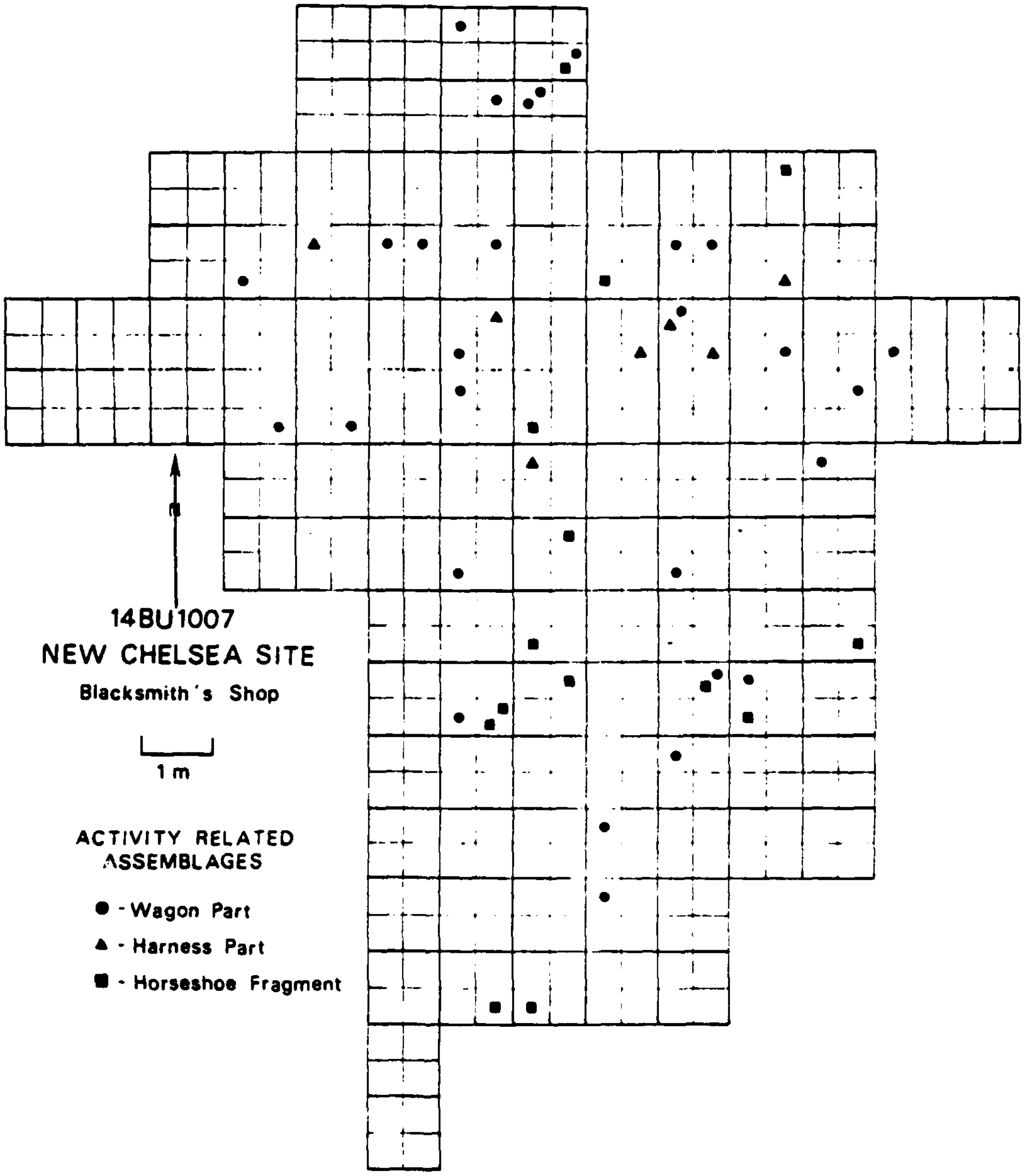

14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1 m
ACTIVITY RELATED ASSEMBLAGES
● - Wagon Part
▲ - Harness Part
■ - Horseshoe Fragment

Figure 10.21.

Significantly, the soil stratigraphy described above is apparently restricted to the low, south-trending ridge. Figure 2.5 above shows that Trench C, only 15 m. east of Trench B, does not exhibit a buried soil but, rather, possesses a weakly developed surface soil with an AC profile similar in morphology to the paleosol. The solum is a secion of Trench C, near N550, and is as follows:

SOIL PROFILE, TRENCH C, 14BU4

Ap	0-20 cm.	Very dark grayish brown (10YR 3/2) silt loam; granular structure, neutral; smooth, abrupt boundary; contains numerous, fine, bioturbated laminae of whitish silts.
A11	20-52 cm.	Very dark grayish brown (10YR 3/2) silty clay loam; granular structure; neutral; smooth, gradual boundary.
A12	52-84 cm.	Very dark grayish brown (10YR 3/2) silty clay loam; subangular blocky structure; common mottles of 10YR 4/4 and 7.5YR 4/4; neutral; smooth, gradual boundary.
AC	84-120 cm.	Very dark grayish brown (10YR 3/2) silty clay loam; subangular blocky structure; many, large mottles of 10YR 4/4 and 5.4YR 4/4; neutral.

The differences between the soils on and off the low ridge are most likely due to differences in surface drainage. The weakly developed AC profile of the soil in Trench C is comparable in most respects to the Verdigris series, as described by Penner et al. (1975). This soil presents several features indicative of impeded drainage. Mottling in the lower horizons is indicative of frequent saturation, resulting in alternating periods of oxidation, producing the lighter, reddish colors, and reduction, producing gray colors (Buol et al. 1973). The Verdigris series is classified by Penner et al. (1975) as a "cumulic" soil, meaning that it is subject to periodic deposition of small increments of sediments, to the extent that pedogenic processes must constantly adjust to additions of sediment, forming over time a relatively thick A horizon, overlying a C horizon (Riecken and Poetsch 1960). The weak development of the profile in Trench C implies that conditions are not sufficiently stable for a Bt horizon to develop.

Such is not the case atop the alluvial ridge, where the presence of a moderately developed B horizon indicates long term surficial stability. The upper soil is similar to the Vanoss series, as described and mapped by Penner et al. (1975). The soil described in XU102 possesses a moderately developed (Birkeland 1974:23), minimal argillic (Bt) horizon (defined by Soil Survey Staff 1975; see also Buol et al. 1973). In humid and subhumid North America, the formation of argillic horizons, characterized by downward translocation and accumulation of clay, requires at least 550 years (Parsons et al. 1970) and probably 1000-2500 years (Parsons et al. 1962; Ruhe 1969:167; Bilki and Ciolkosz 1977).

Differential development of soils in alluvial landscapes is often interpreted in terms of flood frequencies; it is argued that surfaces exhibiting well-developed soils are elevated high enough to be beyond the reach of floods which periodically inundate lower levels (Walker and Coventry 1976). Although the terrace-edge berm with its moderately

Wagon and Harness Parts

In classifying the artifacts contained in Table 10.6 as wagon and harness parts, several functional considerations were taken into account. All chain related specimens were included because, although multifunctional, their use with wagons and harnesses was among the most common. The wagon strap bar specimens, which are perforated iron bar fragments, could have been used for various purposes, but such material was an important wagon component. These are the most prominent examples but some of the smaller classes are also multifunctional. The inclusion of these specimens in this assemblage was based on a determination by means of literature search and experience indicating wagon and harness functions to be the most common (Fig. 10.22).

The small size of the assemblage should not be misleading. Wagon and harness repair was an important part of the blacksmith's work in a rural community. Two factors can account for the small sample size: (1) many wagon and harness parts could be reused; repair was more common than replacement; (2) lacking their wood and leather functional context, many wagon and harness parts may not have been recognized as such.

Because of the small number of specimens no concentrations can be defined. However, it can be seen in Figure 10.21 that 63% (19) of the wagon parts and 86% (6) of the harness parts occur in units either on the same north line as, or north of, Feature 1. This suggests that work involving wagons and harnesses may have generally been performed in the northern portion of the shop. This is further discussed in the section on nuts and bolts below.

Nuts and Bolts

The nuts and bolts assemblage contains fasteners that require a previously prepared hole or are threaded. Included are common nuts, bolts, rivets, and screws (Fig. 10.22). The composition of the assemblage is provided in Table 10.7.

A number of specimens may have entered the archaeological record accidentally through loss, but many show signs of having been cut or broken. Among the more interesting pieces believed to have been purposefully discarded are several nuts which appear to be rejects. Four specimens, two from each level, were being threaded at an angle and apparently discarded. There is no direct evidence that either bolts or screws were being produced; however, all the rivets appear to be hand-wrought.

Over 63% (23) of the nuts and bolts assemblage occurs on the same north line or north of Feature 1 (Fig. 10.23). Those specimens in the northern portion of the site also tend to occur more closely together than those in the southern units. The largest number of contiguous units containing nuts and bolts is in the area of Feature 2. There is also a small cluster in the units north of Feature 1. This occurrence tends to support the idea that wagon-related activities occurred in the northern part of the site as members of this assemblage were commonly used in such work.

developed soil profile is topographically higher than adjacent surfaces with weakly developed AC soils, the absolute difference in elevation is only 10-20 cm. (see Figure 2.6 above), insufficient for there to be an appreciable difference in the regularity with which the surfaces are flooded. It is

whose ultimate concerns are man-land relationships involved in site selection by prehistoric people. One problem faced by archeologists in interpreting prehistoric man-land relationships is the frequent uncertainty as to whether or not landforms in the vicinity of a site are the same ones

density and the uniformity of the scatter, selection of a grid unit smaller than 25 m^2 would have resulted in a large number of low density squares, with only minimal increases in the resolution of intra-site clustering. The 25 m^2 grid unit is thus believed to represent sufficiently spatial patterning on the site surface.

Table 10.7. Nuts and bolts assemblage.

Type	Counts Level 1	Level 2
Bolts	19	16
Countersink Head Screw		1
Eye Bolt	2	
Eye Screw	1	
Flathead Screw		1
Nuts	3	15
Rivet	4	9
Screw	1	
Tire Bolt (?)	1	
	31	42

Table 10.8. Woodworking tools.

Type	Counts Level 1	Level 2
Adze	1	
Chisel	5	3
Drill		1
Gauge	1	2
Spokeshave		1
	7	7

Woodworking Tools

Woodworking was one of the specialized tasks which a blacksmith was called upon to perform. The specialized toolkit is well represented by the New Chelsea assemblage, with the exception of saws and hammer (Table 10.8 and Fig. 10.24). Generally, the woodworking done by a smith was related to wagons, particularly their wheels. This assemblage is comprised of tools suitable for such heavy work. However, a hand-forged gouge from the southeast portion of the site has a narrow, grooved working tip of the type generally used for scroll work and other fine work.

Considering the size of this sample, it is not possible to note concentrations. Yet, it can be seen that 71% (5) of the specimens from level 2 are strongly associated with Features 1 and 2 in the northern units (Fig. 10.23). As it has already been pointed out that woodworking tools were involved with wagon work, this distribution supports the contention that activities involving wagons took place north of Feature 1.

Clustering is indicated by the fact that 20 of the 30 grid units have observed frequencies of artifacts less than the mean. By contrast, 2167 of the total 3351 artifacts (ca. 65%) were recovered from only 10 grid units.

In Figure 2.7a, three areas of concentration are visible. The southernmost of these, termed Area S, has its highest concentrations at N475 E475 (referring to the southwest corner of the grid unit) and corresponds to the southern area noted by previous investigators (Eoff and Johnson 1968; Root 1978). The northern area of the site (Area N), contains two concentrations of prehistoric debris, comprising western and eastern subareas. The western subarea (Area Nw) centers at N625 E450, while Area Ne, southeast of Nw, centers at N600 E500.

The topographic correlation of the three site areas with the abandoned levee is shown in Figure 2.7 by a superimposed contour which delimits the upper edge of the terrace slope, and the levee crest. Area Ne is situated on the crest of the levee, while Area Nw is situated on a relatively broad and gently sloping area of the levee's west face. Area S is concentrated at the diffuse southern terminus of the levee.

Individual distributions for chipped stone and limestone, the two most abundant categories of prehistoric artifacts, are shown in Figure 2.7, b and c. Like the total debris distribution, class intervals for material density are shown in standard deviations from the mean. Clustering is even more pronounced for these individual categories, in that the highest artifact densities of both chipped stone and limestone are four standard deviations above the mean. The maximum density of chipped stone (n=239) occurs in Area S (N475 E475) with lesser concentrations in Area Ne (N575 E475, where N=142; and N600 E500, where n=144). By contrast, the maximum density of limestone (n=207) is in Area Nw (N625 E450), with lesser concentrations in Areas Ne and Nw.

Other artifact categories from the grid surface collection suggest further differences between the three intra-site areas. Figure 2.8 shows the distribution of shaped tools, ceramics, faunal remains, quartzite, burned earth, ferrous oxides, and sandstone.

Shaped tools (Figure 2.8a) are specimens of chert sufficiently modified by prehistoric artisans to change significantly the outline and cross-section of the original blank. This category includes projectile points and a variety of other bifacial tools. Figure 2.8a shows that shaped tools were recovered from Area S and Ne, but not from Area Nw. In addition, three tools were recovered from the extreme north end of the grid; these are attributed to a Plains Village occupation, which is most likely an eastward extension of 14BU92, located immediately north of 14BU4. A strong correspondence between the distribution of shaped tools and chipped stone is apparent by comparison of Figures 2.8a and 2.7b.

Ceramics (Figure 2.8b) were recovered primarily from Area Ne, which yielded 12 of the total 16 sherds. Area S yielded two sherds, and two sherds were recovered from the western margin of Area Nw.

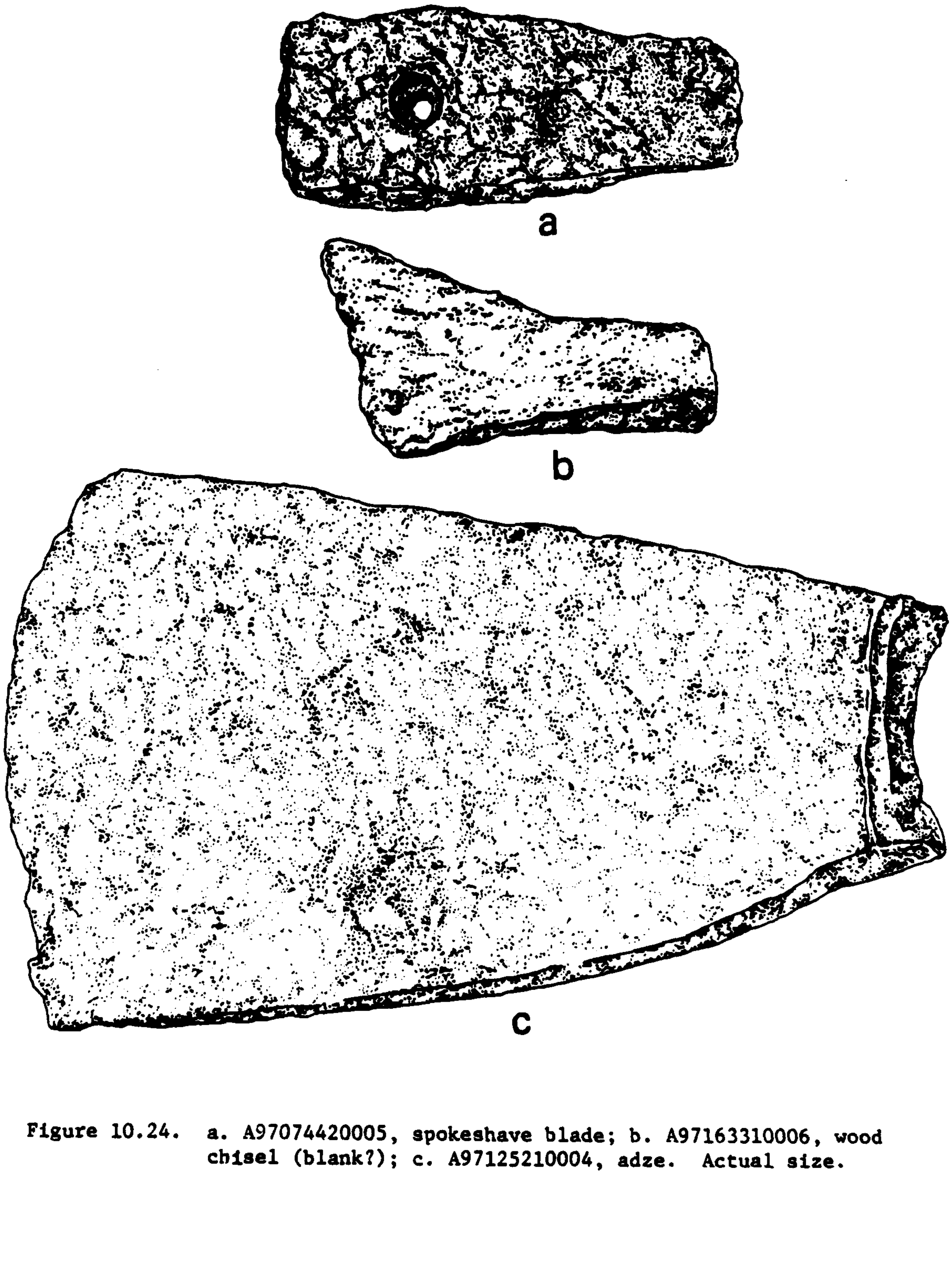


Figure 10.24. a. A97074420005, spokeshave blade; b. A97163310006, wood chisel (blank?); c. A97125210004, adze. Actual size.

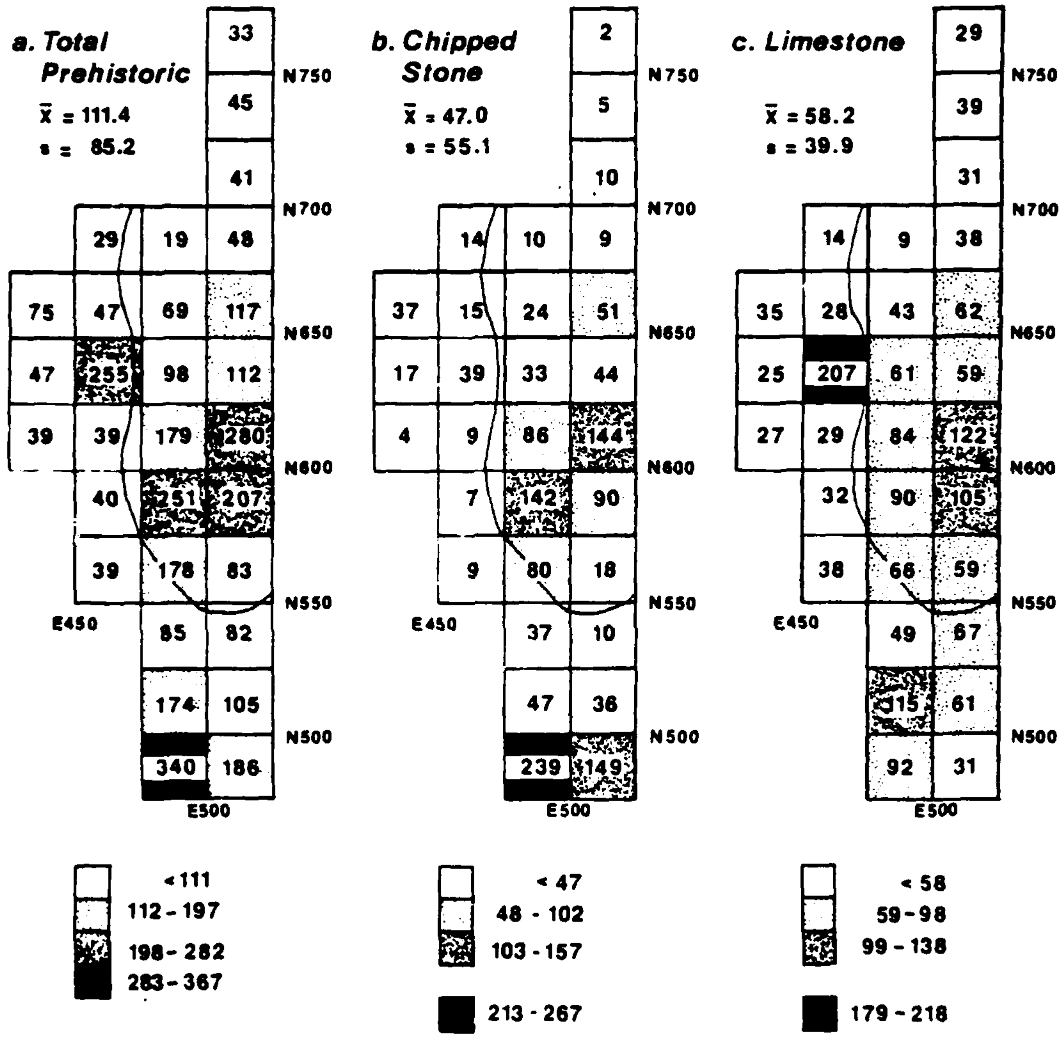


Figure 2.7. Distribution of major artifact classes in gridded surface collection of 14BU4. Contour line indicates top of terrace slope, outer edge of levee crest.

Agricultural Implements

In an agrarian community such as Chelsea, a smith would have played a part in repairing and possibly manufacturing agricultural implements. The agricultural assemblage from the shop is comprised of 2 plow shear fragments and 10 mower blades. Of these specimens, only three mower blades are from the second level (Fig. 10.23). Mower blades have been recovered from throughout the wheat field in which the site is located. They are, therefore, considered intrusive. The plow shear fragments may have been related to the shop, but this cannot be certain.

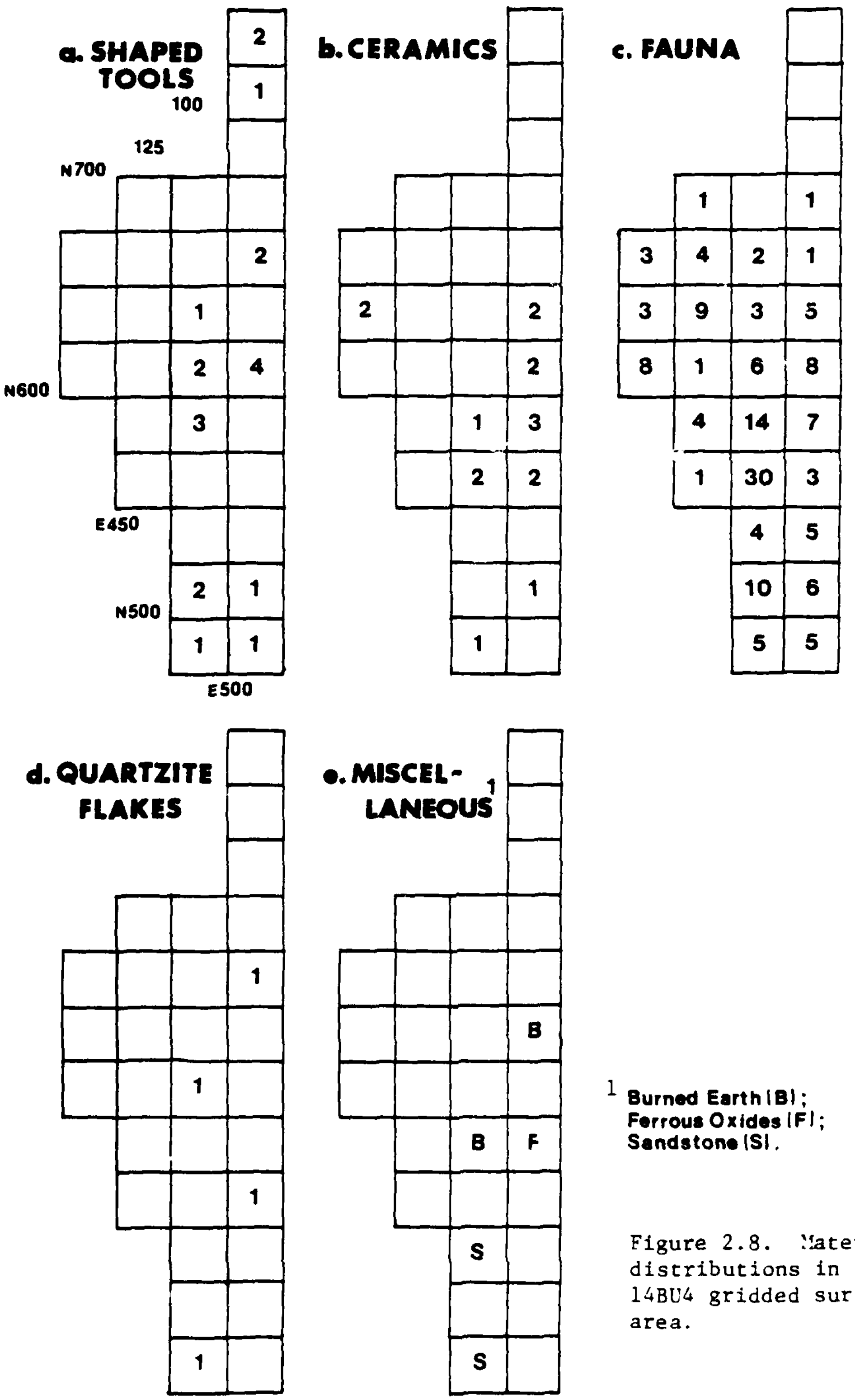
Domestic and Architectural Assemblages

The artifacts listed in Table 10.9 and illustrated in Figure 10.25 have been grouped into a single assemblage because they generally relate to a habitation. In this instance, there was no habitation or residence present. These items are most likely indicators of additional activities that took place at the blacksmith shop. Most were recovered from the postulated disposal areas (Fig. 10.26).

Table 10.9. Domestic and architectural assemblages.

Type	Level 1	Level 2
Buckle	1	1
Cast Iron Stove Fragments		1
Copper Eyelit		1
Doorlatch Hook	1	
Hasp	1	
Hinge		1
Hook	1	
Iron Button		1
Iron Container Fragments	10	2
Kettle Leg	1	
Key		1
Knife Blade	2	1
Latch		1
Pintle	1	
Ovoid Strap Hinge Finial	1	
Scissors	1	1
Staple	1	3
Thumblatch	1	1
Tin Can	1	
Utensil Handle	1	1
Wire Latch		1
	24	17

The few items in the personal classes may well have been lost or discarded by the smith. Those items generally considered household goods are a select subset of such artifacts that could also be of use to a smith. Similar occurrences have been shown at another blacksmith shop (cf. Spivey et al. 1977).



[1] Burned Earth (B); Ferrous Oxides (F); Sandstone (S).

Figure 2.8. Material distributions in the 14BU4 gridded surface area.

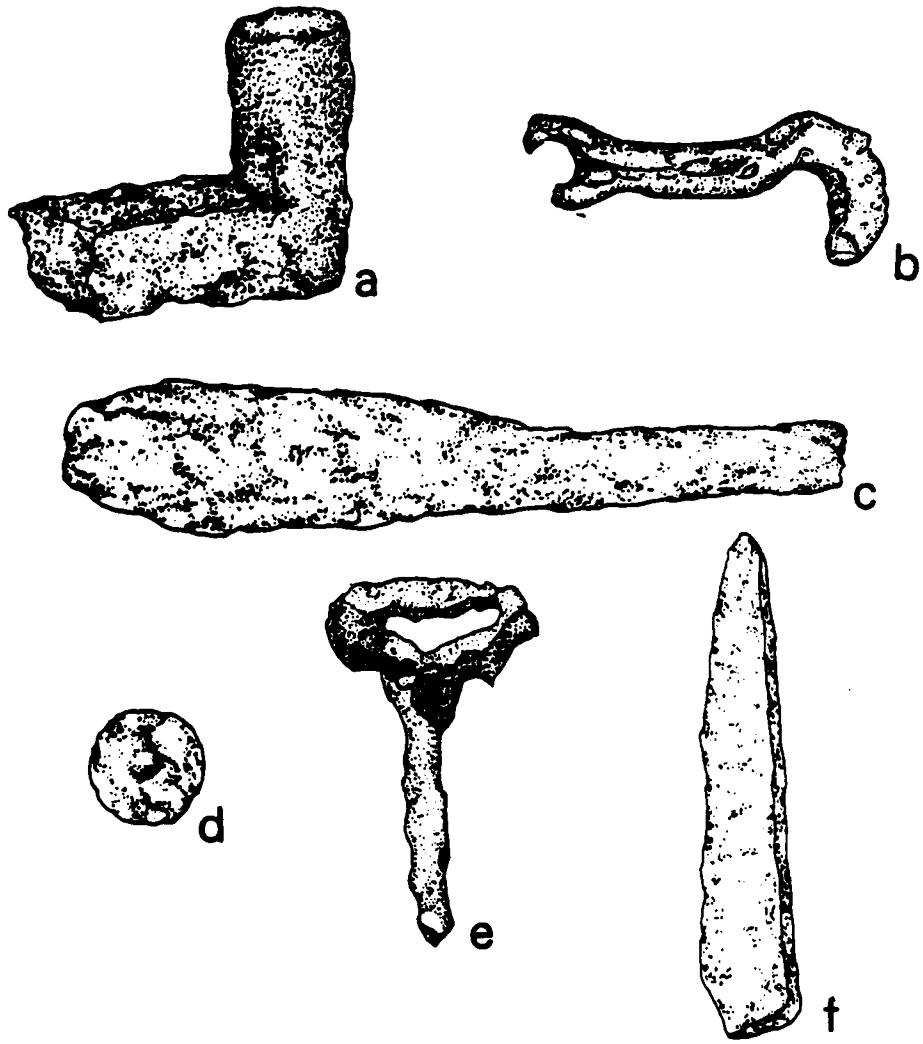


Figure 10.25. Domestic and architectural artifacts: a. A97156110002, pintle; b. A97183210001, latch; c. A97142320005, utensil handle; d. A97144320001, iron button; e. A97139220001, key; f. A97153410001, scissors blade. Actual size.

Faunal remains (Figure 2.8c) are distributed throughout the gridded area, with the exception of the northernmost units. These units coincide with strongly sloping surfaces of the terrace escarpment on which bone, if deposited, would have little chance of survival. Although all three areas of intrasite concentration are apparent in the bone distribution, the highest concentration of fauna (30 specimens in grid unit N550 E475) does not coincide with maxima in either chipped stone or limestone. Another "hot spot" in the faunal distribution, eight specimens from N600 E425, is of questionable prehistoric origin, since five of the eight specimens are mussel shell fragments. Given the low topographic position of the grid unit, these could easily have been introduced from the nearby Walnut River, by either animal predators or floods.

Quartzite flakes (n=4; Figure 2.8d) and burned earth, hematite and sandstone (Figure 2.8e) were recovered in insufficient quantities to warrant conclusive, independent consideration. Burned earth and hematite are apparently associated with Area Ne, quartzite with both Areas S and Ne, and sandstone with Area S.

The distributions shown in Figures 2.7 and 2.8 delimit three clusters of surface material; these are not only spatially segregated but also distinguishable in terms of artifact content. Area S, at the southern end of the levee is dominated by chipped stone, with lesser amounts of limestone and a relatively high frequency of shaped tools. Area Nw, on the levee's west face, has large quantities of limestone but very little chipped stone. Area Ne, on the levee crest, has approximately equal proportions of both chipped stone and limestone, with relatively high frequencies of shaped tools, bone, and ceramics. In terms of artifact content, the off-levee areas S and Nw show less diversity than the levee crest Area Ne with its broad range of artifact categories. These differences in content, along with differences in topographic context, suggest that the three intrasite areas represent functional differentiations in the prehistoric utilization of the abandoned levee as an occupational surface.

Before exploring the possibility of functional diversity, we must first consider the extent to which the archeologically observed spatial patterns accurately reflect prehistoric site-building processes. This is an important concern of archeologists attempting to interpret intra-site patterning from surface distributions (see Binford 1972), since the prehistoric pattern can be biased by modern agriculture (see Roper 197) and surface erosion. In interpreting surficial or shallowly buried cultural deposits such biases must be evaluated. In the following discussion, excavation data are used to suggest biasing factors introduced by post-depositional disturbance.

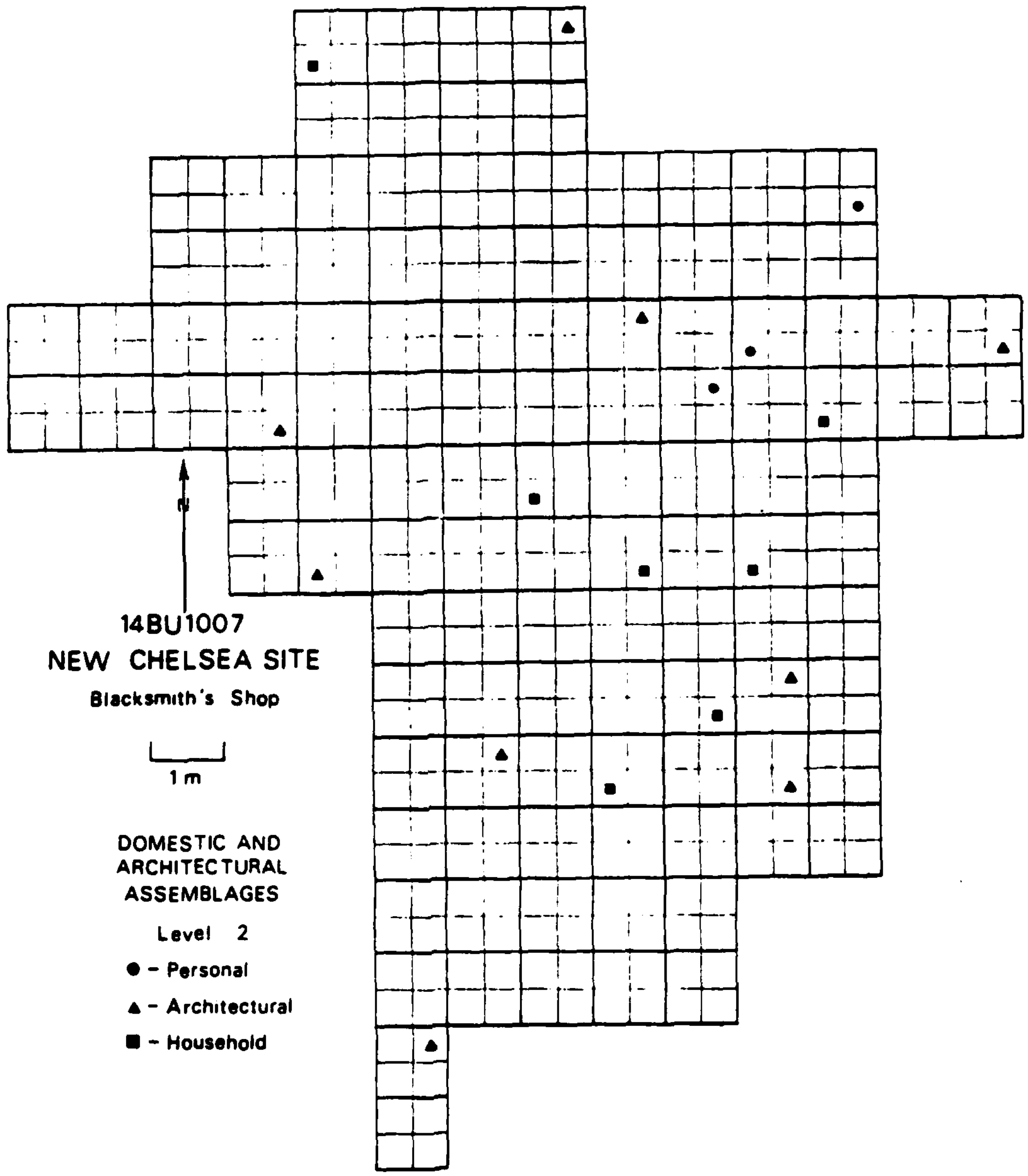

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1 m
DOMESTIC AND ARCHITECTURAL ASSEMBLAGES
Level 2
● - Personal
▲ - Architectural
■ - Household

Figure 10.26.

The architectural specimens present a more difficult problem for explanation as no structures were present. Most are probably wagon and carriabe parts. The pintle, wire latch, and staples suggest that a fence or corral may have been present, but there is no direct evidence for such a structure.

Square Nails

As can be seen in Tables 10.10 and 10.11, a great variety of square nails, both handwrought and common cut, were recovered. The sizes represented cross-cut virtually all the functions for which nails are used in construction (cf. Fontana and Greenleaf 1962). Yet, there is no evidence of a structure around the blacksmith shop. This makes the explanation of the nails' presence difficult.

Table 10.10. Handwrought nails.

Type	Counts Level 1	Level 2
Fragments	33	35
2d	1	
4d	1	
5d	1	
6d		1
7d	1	2
8d	1	2
10d	2	
16d		1
30d	1	1
40d	1	
Scupper		1
Tack		1
Wagon (?)		1
	42	45

Table 10.11. Common cut nails.

Type	Counts Level 1	Level 2
Fragments	62	120
1d	1	
2d	1	
3d	6	2
4d	4	3
5d	4	1
6d		3
7d	3	3
8d	4	1
9d	2	1
40d	1	
Plancher		1
	88	135

Some of the nails could have originated from abandoned work benches and other such equipment that even an outdoor smithy was likely to have. Most may have derived from the smith's woodworking activity. The latter suggestion is strongly supported by the occurrence of many of the specimens in midden areas (Fig. 10.27), suggesting discarded fragments and pieces of wood.

The handwrought specimens may represent nails made for special purposes. These nails tend to be larger than the common cut specimens. It is interesting to note that over 60% (26) of the hand-wrought specimens are present in the units on the same north line as, or north of, Feature 1. This is the area previously suggested to be a possible wagon and/or woodworking area. If handwrought nails were produced for special needs during the course of these functions, this is the type distribution that would be expected. Common cut nails are evenly distributed over the site.

There is another interesting aspect of the handwrought and common cut nail distributions aside from that just noted. On a gross level, the two types appear to be co-distributed. However, in only 10 quadrants do they co-occur, which accounts for only 10% of all units containing handwrought nails and 26% of all units containing common cut nails. This distributional dichotomy cannot yet be explained.

Stoneworking Tools

Two stone chisel fragments were recovered, one from each level. Both appear to have been cut from their bodies. There is no evidence that the smith engaged in stoneworking and this was not a typical blacksmith activity. The smith may have been modifying the tool for a stonemason (there were a number of them in Butler County at the time) or for his own use.

Arms

The base of a lead bullet recovered from one of the northernmost units is the only artifact in the arms assemblage. It is estimated to be in the .50 calibre range. The upper half of the bullet has been cut away. The smith may have cut it in order to use the lead for some other purpose.

Reconstructing the Blacksmith Shop

Using the distributions just discussed, it is possible to propose an activity area reconstruction of the blacksmith shop. Due to the nature of the assemblages, virtually all being comprised of discarded material, the primary distinctions that can be drawn are between disposal areas, work,

Table 2.3. Inventory of materials recovered from Levels 1-4, XU101.

Material	LEVEL 1 00-20 cm BS	LEVEL 2 20-30 cm BS	LEVEL 3 30-40 cm BS	LEVEL 4 40-50 cm BS	TOTAL
Shaped Tools	14	7	0	0	21
Chipped Stone	1643	1215	199	21	3078
Ceramics	25	5	1	0	31
Limestone	716	49	4	6	775
Sandstone	3	4	0	0	7
Weathered Chert	0	0	1	0	1
Ferrous Oxides	4	1	0	0	5
Burned Earth	244	281	30	6	561
Bone	246	237	45	24	552
Charcoal	11	19	5	7	42
Historic	64	2	0	0	66
Gravel	385	34	15	3	437
TOTAL	3357	1854	311	67	5589
TOTAL PREHISTORIC (minus historic, gravel)	2908	1818	296	64	5086

Table 2.4. Inventory of materials recovered from Levels 1 and 2, XU102.

	LEVEL 1 00-20 cm BS	LEVEL 2 20-30 cm BS	
Shaped Tools	13	2	15
Chipped Stone	733	218	951
Ceramics	9	3	12
Limestone	677	39	716
Sandstone	4	5	9
Burned Earth	57	14	71
Bone	58	17	75
Charcoal	1	2	3
Historic	11	1	12
Gravel	170	23	193
TOTAL	1734	324	2058
TOTAL PREHISTORIC (minus historic, gravel)	1553	300	1853

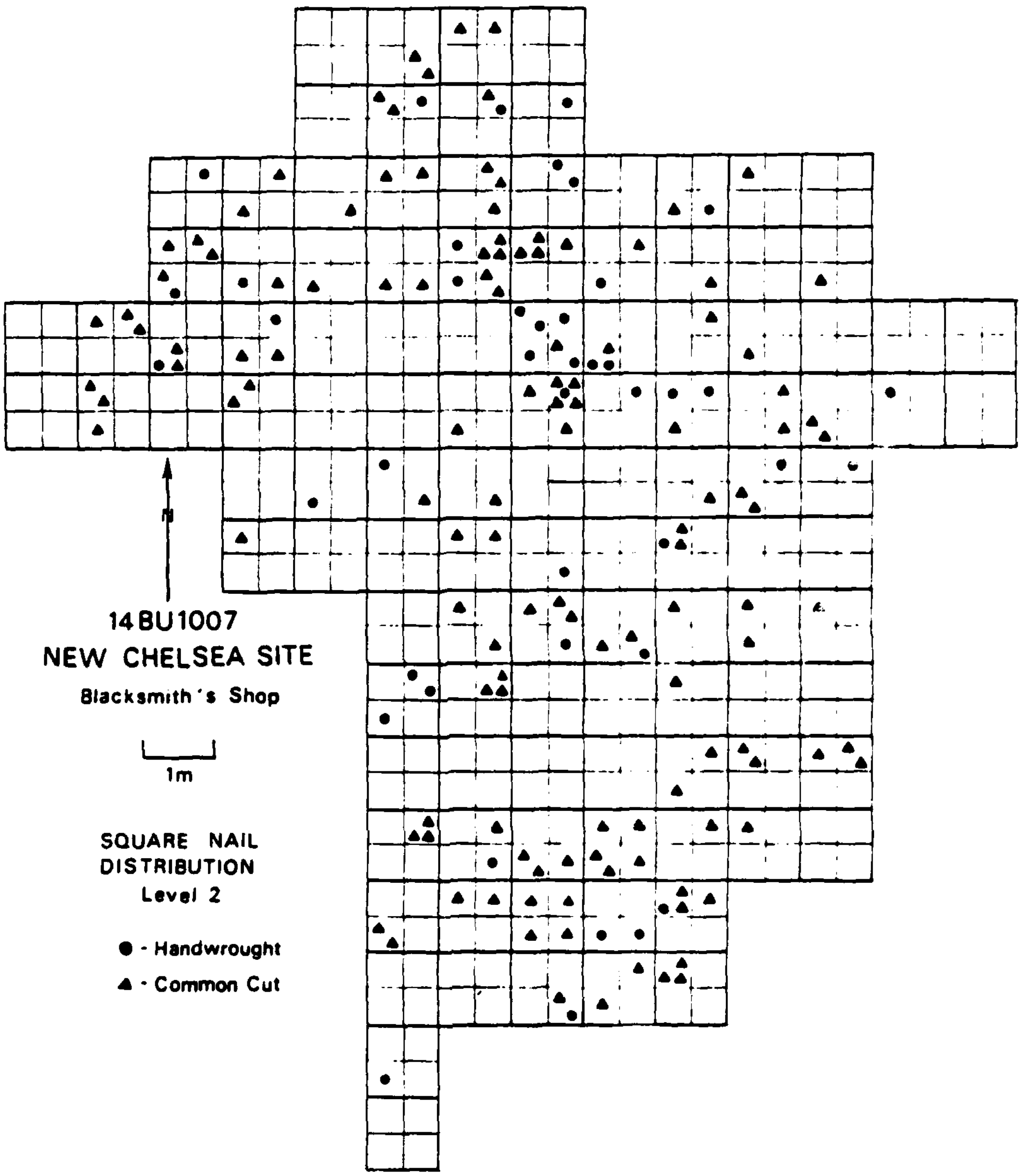

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
SQUARE NAIL
DISTRIBUTION
Level 2
● - Handwrought
▲ - Common Cut

Figure 10.27.

In XU101, artifact densities decreased abruptly below the base of Level 2 at 30 cm. BS (Table 2.3). Below this depth, in Levels 3 and 4, artifacts were sparsely distributed and often associated with rodent disturbances. Artifacts in these levels probably represent downward dispersion by pedologic and bioturbational agencies from a single occupational residue in Levels 1 and 2. Controlled excavation of the surface component in XU102 did not extend below Level 2; excavators did, however, note decreasing artifact densities as the transition to the underlying subsoil was encountered in Level 2. The surface component at XU102, like XU101, is thus believed to originate in the upper 30 cm. of the surface soil. Based on the depth distributions in Tables 2.3 and 2.4, it is believed that surface materials in Areas S and Ne probably reflect prehistoric spatial patterning with relative accuracy.

Material Recovered

Chipped Stone

Chipped stone debitage was the most abundant material recovered in both excavation units and surface collections. Tables 2.5, 2.6, and 2.7, which tabulate the chipped stone from the grid surface collection, show several general characteristics of the surface component's lithic assemblage. Florence A chert (49% of the assemblage) is the predominant chert type (Table 2.7), with Florence B and Flint Hills Green in intermediate proportions (18% and 15%, respectively), and Flint Hills Light Gray (9%), Cresswell (3%) and Indeterminate (5%) cherts less abundant. Five flakes similar to Alibates, a chert which originates in western Texas and eastern New Mexico (Kelly and Green 1959), is the only non-Flint Hills lithic type identified in the assemblage.

Most of the lithic debris from the site surface is thermally altered. Only 448 of the 1368 specimens (33%) show no sign of heat exposure (Tables 2.6 and 2.7). Of the remaining 920 specimens, 243 are thermally damaged.

Noncortical elements, representing intermediate stages of lithic reduction, are most abundant in the assemblage, totaling 76.8% of the assemblage, compared to only 23.5% cortical elements. The initial reduction of lithic raw material was thus not strongly emphasized in prehistoric activity at the site. Only five bifacial trimming flakes (0.4% of the assemblage) were recovered from the site. It is, however, assumed that these items are underrepresented in the surface collection because of their small size and do not accurately reflect amount of final stage lithic reduction carried out. By the same size criterion, it is likely that cortical elements, being on the average larger in size than secondary and tertiary reduction products, are overrepresented in the surface collection.

Although XU101 and XU102 represent only small areas of the site, artifact samples from these proveniences provide a better representation, in many ways, of the total range of materials present in the cultural deposit. Because all excavated soil was screened through ¼ inch mesh, the excavated samples represent much more complete recovery than is possible in a surface collection.

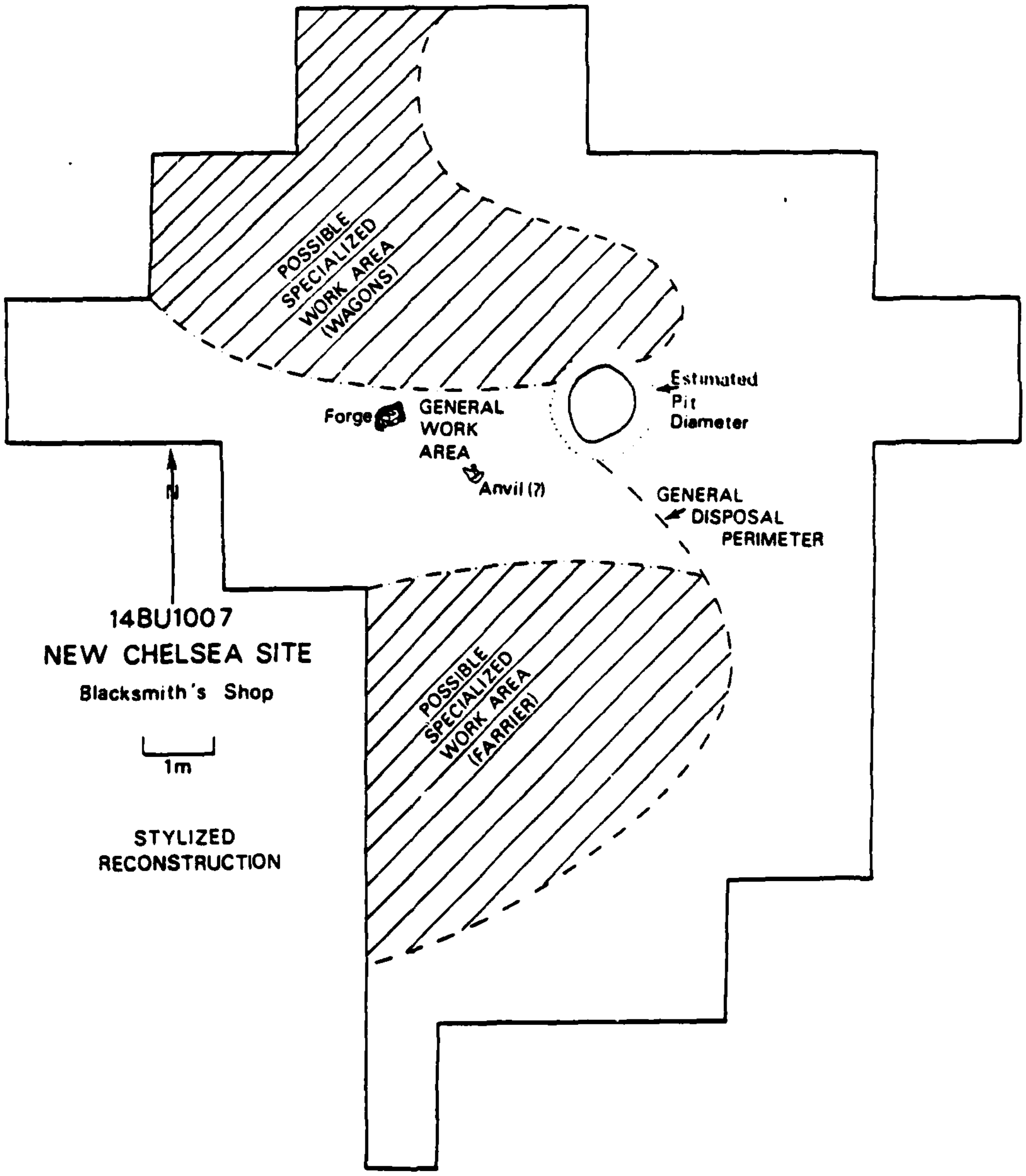

POSSIBLE SPECIALIZED WORK AREA (WAGONS)
Estimated Pit Diameter
Forge
GENERAL WORK AREA
Anvil (?)
GENERAL DISPOSAL PERIMETER
N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
STYLIZED RECONSTRUCTION
POSSIBLE SPECIALIZED WORK AREA (FARRIER)

Figure 10.28.

Table 2.5. Technological classes and material types of chipped stone debitage, from the gridded surface collection.

Technological Class		Florence A	Florence B	Flint Hills Lt. Gray	Flint Hills Green	Cresswell	Alibates	Indeterminate	TOTAL #	TOTAL %
CORTICAL ELEMENTS:										
Flakes		97	39	12	26	4	-	16	194	(14.2)
Chunks		48	24	5	11	2	-	13	103	(7.5)
Thermoclastic shatter		9	1	1	3	-	-	13	25	(1.8)
NON-CORTICAL ELEMENTS										
Flakes		471	167	91	153	36	5	21	944	(69.0)
Chunks		29	14	9	13	1	-	4	70	(5.1)
Thermoclastic Shatter		17	3	-	3	1	-	1	27	(2.0)
BIFACIAL TRIMMING FLAKES		2	1	1	1	-	-	-	5	(0.4)
TOTAL	#	673	249	119	210	44	5	68	1368	
	%	(49.2)	(18.2)	(8.7)	(15.4)	(3.2)	(0.4)	(5.0)		

disposal of certain classes of artifacts within this general area suggests specialized activity areas that will be discussed below.

The defined disposal perimeter leaves a work area of approximately 40 square meters. Disposal patterns suggest possible specialized work areas within this large portion of the site. The preponderance of wagon and harness parts, nuts and bolts, and large nails (particularly the handwrought specimens) in the northern units of the site suggests that wagon related activities were conducted in that area. Such a location is convenient to the forge, Feature 1, which would have been indispensable in many such activities, particularly those involving the wheels.

The significant number of horseshoe nails and fragments in the southern units suggest that this may have been the area where farrier activities were carried out. A second concentration of horseshoe nails primarily northwest of Feature 1 suggests that some farrier activity occurred in the northern part of the site also. It is possible that these two patterns reflect localized farrier activity areas relating to the forge, i.e., hot shoeing took place on the northern part of the site, closer to the forge, whereas cold shoeing was practiced in an area removed from the forge in the southern units.

An area of approximately 3 square meters between Features 1 and 2 is relatively clean. This was the principal or general work area around the forge. All hot work and innumerable other activities would have been conducted in this small area. The need of the smith to move without hindrance in this important area dictates that debris not be allowed to accumulate. Thus, it is not surprising that Feature 2 appears to have been a favored disposal area, as it is conveniently located within kicking and tossing distance.

There is no evidence to suggest that any sort of building ever stood at the site. This was an open-air shop. Exposed to the elements as it was, it was probably operated only seasonally.

The shop did have a permanent forge, represented by Feature 1. It was a mortared brick and limestone structure of unknown shape. Although small, it was sufficiently large for most smith activities.

A blacksmith shop would have had an anvil. It is suggested that Feature 3 represents the foundation for a rooted anvil, but this is a tenuous interpretation. Another possibility, not previously discussed, is that Feature 3 was the pit that formerly held the block to which the anvil was attached. Subsequent to the removal of the block the hole was filled in with fieldstones. In either case, Feature 3 is situated in the ideal position for the anvil and no other interpretation can currently be offered.

It is assumed that work benches and/or tool storage apparatus were present, but there is no direct evidence. Other expected features that cannot be documented are a fuel storage area and a raw material stockpiling area. A general store was located in this portion of the town, and the smith may have acquired necessary fuel and raw materials there as needed without having to store his own.

Table 2.6. Thermal alteration of technological classes of chert debitage in gridded surface collection.

Technological Class	THERMAL ALTERATION STATE Unaltered	Altered	Damaged	TOTAL #	%
CORTICAL ELEMENTS					
Flakes	91	82	21	194	(14.2)
Chunks	21	41	41	103	(7.5)
Thermoclastic Shatter	-	-	25	25	(1.8)
NON-CORTICAL ELEMENTS					
Flakes	324	534	86	944	(69.0)
Chunks	11	16	43	70	(5.1)
Thermoclastic Shatter	-	-	27	27	(2.0)
BIFACIAL TRIMMING FLAKES	1	4	-	5	(0.4)
TOTAL #	448	677	243	1368	
%	(32.7)	(48.5)	(17.8)		

Table 2.7. Thermal alteration of chert materials of debitage from grid surface collection.

Chert Type	THERMAL ALTERATION STATE Unaltered	Altered	Damaged	TOTAL #	%
Florence A	150	415	108	673	(49.2)
Florence B	132	69	48	249	(18.2)
Flint Hills Light Gray	56	38	25	119	(8.7)
Flint Hills Green	58	128	24	210	(15.4)
Cresswell	26	16	2	44	(3.2)
Alibates	1	3	1	5	(0.4)
Indeterminate	25	8	35	68	(5.0)
TOTAL #	448	677	243	1368	
%	(32.7)	(49.5)	(17.8)		

The postulated organization of this blacksmith shop is not unusual. It was, in fact, standard practice to have specialized work areas. Of particular interest here is how well the Chelsea shop compares with an ideal depicted in the classic blacksmith text of the 19th Century (Richardson 1978:72-4). The plan places the forge and anvil in the center with the wagon work area to the north and the shoeing and plow floors to the south. The area encompassed was 24 feet wide and 44 feet long, which is extremely close to the area occupied by the Chelsea shop organization. This is not to say that the shop was copied from Richardson's text, but it does indicate that Chelsea's blacksmith had a proper, professional work organization.

The various types of activities that were performed at the shop have already been discussed. The manner in which tasks were accomplished merits attention, however. From the material culture inventory recovered, it can be deduced that the smith was parsimonious in use of his materials. The small tool fragments indicate a judicious reworking and reuse of tools. Non-tools that have been modified for use also reflect conservative tendencies as well as ingenuity. Most of the tool fragments appear to have been handwrought which indicates that the smith in many ways was efficient in minimizing waste. In sum, the smith who operated this shop demonstrates the same conservative approach to the use of raw materials demonstrated at other historic sites of varying function throughout the project area.

One of the more intriguing questions in historical archaeology is, "Who left this archaeological record?" Often documentary sources can provide the answer. In this instance, the answer is not conclusive, but the circumstantial evidence is strong. It is believed that this was the blacksmith shop of John Houser. The best supporting evidence is a description of the shop left by one of Chelsea's residents:

> John Houser came in sixty-nine and seventy and set up his blacksmith shop on a lot in front of (west of) the store there now. His shop had neither foundation, sides nor roof--the whole business was out of doors. He had few tools, but he made good use of them (Vaught 1916:110).

A final consideration is how this shop relates to others on the Great Plains. Only one other blacksmith shop has been recorded in the literature. It was a shop located in the Oklahoma panhandle during the latter part of the 19th Century (Spivey et al. 1977). Temporally, the two sites are comparable. However, the Oklahoma site, 34CM177 (the Mathewson House site) had a domestic occupation and structure associated. Due to the different natures of the two sites and different approaches in categorizing artifacts, a one to one correlation between assemblages is impossible. However, by carefully selecting types that are of unquestionable or strong association with a blacksmith shop, three broad assemblages held in common by the two sites were defined. These assemblages, metal working, farrier, and wagon and harness, are provided in Table 10.12. Although the raw

Chipped stone debitage from XU101 is described in Tables 2.8, 2.9, and 2.10. Most of the general observations made from the surface collection for the site as a whole apply to XU101. Florence A is the predominant chert type (66%) (Table 2.8); a high frequency of thermal alteration is observed (thermally altered and damaged specimens accounting for 75.6% of the assemblage total; Table 2.9); and intermediate reduction stages (non-cortical elements) are most frequent (Table 2.8). As expected, in XU101, the proportion of small bifacial trimming flakes is higher (2.7%) and that of cortical elements lower (15.1%), than in the gridded surface collection.

Table 2.8 shows that a full range of technological stages is not represented for all material types, suggesting differential utilization of various raw materials in XU101. The two most abundant cherts, Florence A and Florence B, are represented by a full range of reduction by-products, although non-cortical elements are predominant. By contrast, only two of 164 Flint Hills Light Gray chipped stone elements were cortical. Although all three general reduction stages of Flint Hills Green are represented, there is a virtual absence of chunks of this material. An absence of chunks is also noted for Cresswell, which despite the small sample size evinces all three reduction stages.

The significance of the absence of Cresswell and Flint Hills Green chunks is not easily assessed, although data on thermal alteration suggest one possibility. Of the 2457 flakes (non-cortical, cortical and bifacial trimming) from XU101, a high proportion (1723, or 70%) were thermally altered, but not damaged. By contrast, of the 361 cortical and non-cortical chunks, 261 (72%) were thermally damaged. The high incidence of thermally fractured chunks suggests that many of these elements represent angular rubble produced by overexposure to heat. Given the 85% frequency of thermal alteration in XU101, evidence of such failure is not unexpected.

Thermally induced damage, however, is not equally in evidence for all chert types. Of the 282 specimens of thermoclastic shatter (potlids and other thermally induced spalls) from XU101, 263 were of Florence A, Florence B, or Flint Hills Light Gray chert (Table 2.8). Of these, 211 were Florence A, indicating that Florence A was much more likely to be thermally damaged than any other chert type in the assemblage. This conclusion is supported by (Table 2.10), which shows that of the total 846 thermally damaged specimens, 641 (75.8%) were of Florence A chert. The high incidence of thermal damage in Florence A suggests that thermal alteration observed in XU101 is the result of intentional activity by 14BU4's occupants. If thermal alteration was the result of accidental exposure to heat, all cherts should have been equally affected. Table 2.10 shows that this is not the case. Also, the presence of waste products of intentional thermal alteration suggests that the locus of that alteration must have been near XU101, since it is unlikely that thermoclastic waste products would be removed far from their point of origin.

The combined low frequency of Flint Hills Green and Cresswell chunks and thermoclastic shatter suggests that these materials were not extensively heat treated in the vicinity of XU101, but instead were altered elsewhere, brought into the area and discarded. The slightly higher frequencies of thermally damaged chunks and spalls of Florence B and Flint Hills Light Gray

counts differ, the constituent percentages of the three assemblages are quite similar. The implication is that similar activities on different sites will produce numerically similar assemblages. Given additional sites, it may be possible to define a Great Plains blacksmith shop pattern much along the lines of the patterns that have been defined for historic sites in the eastern United States (cf. South 1977).

Table 10.12. Comparisons of assemblages from 14BU1007 and 34CM177.

	14BU1007		34CM177	
Assemblage	Count	%	Count	%
Metal Work	269	59.1	1111	56.1
Farrier	153	33.6	741	37.4
Wagon and Harness	33[2]	7.3	129	6.5
	455	100.0	1981	100.0

[1]Does not contain horseshoe tips category.
[2]Does not contain any artifacts from the nuts and bolts assemblage.

Conclusions

The Phase III investigations at the New Chelsea site have contributed towards the achievement of the overall project goals. By demonstrating that data can be extracted from the disturbed portions of the site, the Phase III work has opened new opportunities for research. The data recovered can aid in reconstructing Chelsea and making comparisons between this town and others.

The similarity between the Chelsea blacksmith shop and the Oklahoma panhandle smithy suggests that other similarities between these areas may be fruitful for research. Particularly interesting would be a comparison between Chelsea and Old Hardesty, an extinct panhandle town that is currently the only other Plains settlement that has been the object of archaeological research and the results published (Lees 1977). Certain general similarities can already be noted: parsimonious use of resources and a fairly scant archaeological record. More detailed comparisons will be possible after additional fieldwork has been accomplished at Chelsea.

Current research at Thurman, Kansas, an extinct community approximately 40 miles northwest of Chelsea, suggests that major variations may exist between cattle-oriented and agrarian-oriented Great Plains towns (Joe Hickey, director of the Thurman research project, personal communication). However, further comparisons will have to wait until fieldwork is completed at the two sites and the data synthesized.

In short, the research potential at the New Chelsea site is tremendous. Additional work in the disturbed portions of the site needs to be conducted and attention should be turned towards identifying any possible undisturbed areas. Samples from other types of occupations in the town

Table 2.8. Technological classes and material types of chert debitage from XU101.

Technological Class		Florence A	Florence B	Flint Hills Lt. Gray	Flint Hills Green	Cresswell	Indeterminate	TOTAL #	TOTAL %
CORTICAL ELEMENTS:									
Flakes		209	39	1	18	2	47	316	(10.2)
Chunks		71	4	1	0	0	8	84	(2.7)
Thermo-Shatter		55	4	0	2	0	7	68	(2.2)
NON-CORTICAL ELEMENTS									
Flakes		1292	397	128	142	35	63	2057	(66.4)
Chunks		213	28	16	1	1	18	277	(8.9)
Thermo-Shatter		166	25	13	6	0	4	214	(6.9)
BIFACIAL TRIMMING FLAKES		41	25	5	12	1	0	84	(2.7)
TOTAL	#	2047	522	164	181	39	147	3100	
	%	(66.0)	(16.8)	(5.3)	(5.8)	(1.3)	(4.7)		

need to be gathered. The documentary data concerning the town, particularly tax records, still hold wealths of information that can be used to guide the excavation program by identifying significant areas within the town. Through a coordinated system of archaeological and historical investigation, Chelsea's storehouse of information can be tapped and significant new contributions can be made to the fields of anthropology and history.

Table 2.9. Thermal alteration of technological classes of chert debitage in XU101.

Technological Class	THERMAL ALTERATION STATE Unaltered	Altered	Damaged	TOTAL #	%
CORTICAL ELEMENTS					
Flakes	50	215	51	316	(10.2)
Chunks	6	23	55	84	(2.7)
Thermo-Shatter	-	-	68	68	(2.2)
NON-CORTICAL ELEMENTS					
Flakes	369	1453	235	2057	(66.4)
Chunks	11	60	206	277	(8.9)
Thermo-Shatter	-	-	214	214	(6.9)
BIFACIAL TRIMMING FLAKES	12	55	17	84	(2.7)
TOTAL #	448	1806	846	3100	
%	(14.5)	(58.3)	(27.3)		

Table 2.10. Thermal alteration of chert materials of debitage from XU101.

Chert Type	THERMAL ALTERATION STATE Unaltered	Altered	Damaged	TOTAL #	%
Florence A	201	1205	641	2047	(66.0)
Florence B	167	259	96	522	(16.8)
Flint Hills Light Gray	24	84	56	164	(5.3)
Flint Hills Green	19	137	25	181	(5.8)
Cresswell	4	34	1	39	(1.3)
Indeterminate	33	87	27	147	(4.7)
TOTAL #	448	1806	846	3100	
%	(14.5)	(58.3)	(27.3)		

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suggest that these cherts, like Forence A, may have been altered nearby.

The chipped stone assemblage from XU102 (Tables 11 to 13) contrasts with XU101 in several respects. Florence A comprises only 44.0% of XU102's debitage, compared to 66% in XU101. Frequencies of Flint Hills Green and Cresswell cherts were markedly higher in XU102: 24.0% and 5.9%, respectively, compared to 5.8% and 1.3% in XU101. Equivalent proportions of Flint Hills Light Gray and Florence B were present in the two units.

Differences in thermal alteration also characterize the assemblages. A higher proportion of unaltered specimens was recovered from XU102 (22.4%, compared to XU101's 14.5%), and a lower percentage of thermally damaged elements (14.9% vs. 27.3%) was noted. XU102 yielded only 24 specimens of thermoclastic shatter (2.2% of the assemblage, versus XU101's 9.1%). In XU102, as in XU101, proportionally more chunks than flakes were thermally damaged, but the frequency of thermally damaged chunks relative to the total number of chunks was lower (48% in XU102 versus 70% in XU101). In XU102, cortical chunks were more frequently damaged than non-cortical chunks.

A major difference between XU101 and XU102 in chipped stone thermal alteration is in the frequency of thermally damaged Florence A. In XU102, only 57 or 141 Florence A specimens (12.1%) were damaged, compared to 31% in XU101. In both excavation units, Florence A was the most frequent thermally damaged chert, but in XU102, only 36% (57 of 157) of the total thermally damaged specimens were Florence A, compared to 75% in XU101.

To summarize, the differences between the kinds and quantities of lithic waste materials in XU101 and XU102 suggest differences in lithic-technology-related activities. The comparatively high frequencies of thermoclastic shatter and thermally damaged chunks in XU101 suggests that thermal alteration was accomplished in the vicinity of the unit. The proportional dominance of thermally damaged Florence A suggests that this material was being selected preferentially for alteration. In the absence of fire pits or hearths in XU101, it is probable that thermally damaged lithic debris from XU101 represents a dump of waste products generated by heat treatment at facilities elsewhere on the site.

By contrast, XU102 lacks the high frequency of thermal damage and the selectivity of chert types. Lithic related activities in this area were apparently more generalized among several raw materials, given the comparitively high frequencies of Flint Hills Green and Cresswell relative to Florence A. Either these activities did not involve large amounts of thermal alteration, or most of the thermoclastic debris from that process was discarded elsewhere.

XU101 is located in Area S, XU102 in Area Ne. To see if the contrasting patterns observed in these spatially limited areas apply in general to the two areas, lithic debitage from the maximum density surface units of the two areas was compared (Table 14). In terms of totals of thermal alteration, technological class, and raw material, the variation between surface collected samples from the areas is insignificantly small. Thus, the differences between XU101 and XU102 must be interpreted as spatial variations within areas of the site, rather than reflecting broad differences

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Table 2.11. Technological classes and material types of chert debitage from XU102.

Technological Class		Florence A	Florence B	Flint Hills Lt. Gray	Flint Hills Green	Cresswell	Indeterminate	TOTAL #	TOTAL %
CORTICAL ELEMENTS									
Flakes		74	10	4	29	12	24	153	(14.5)
Chunks		21	2	2	7	-	6	38	(3.6)
Thermoclastic Shatter		5	2	1	-	-	2	10	(0.9)
NON-CORTICAL ELEMENTS									
Flakes		340	120	46	200	49	18	773	(73.4)
Chunks		16	15	-	11	1	10	53	(5.0)
Thermoclastic Shatter		7	2	1	3	-	1	14	(1.3)
BIFACIAL TRIMMING FLAKES		8	1	-	3	-	-	12	(1.1)
TOTAL	#	471	152	54	253	62	61	1053	
	%	(44.7)	(14.4)	(5.4)	(24.0)	(5.9)	(5.8)		

Table 2.12. Thermal alteration of technological classes of chert debitage in XU102.

Technological Classes		THERMAL ALTERATION STATE			TOTAL	
		Unaltered	Altered	Damaged	#	%
CORTICAL ELEMENTS						
Flakes		42	96	15	153	(14.5)
Chunks		3	13	22	38	(3.6)
Thermoclastic Shatter		-	-	10	10	(0.9)
NON-CORTICAL ELEMENTS						
Flakes		186	513	74	773	(73.4)
Chunks		5	26	22	53	(5.0)
Thermoclastic Shatter		-	-	14	14	(1.3)
BIFACIAL TRIMMING FLAKES		-	12	-	12	(1.1)
TOTAL	#	236	660	157	1053	
	%	(22.4)	(62.7)	(14.9)		

Table 2.13. Thermal alteration of chert materials of debitage from XU102.

Chert Type		THERMAL ALTERATION STATE			TOTAL	
		Unaltered	Altered	Damaged	#	%
Florence A		44	370	57	471	(44.7)
Florence B		23	88	41	152	(14.4)
Flint Hills Light Gray		29	17	8	54	(5.1)
Flint Hills Green		74	154	25	253	(24.0)
Cresswell		50	10	2	62	(5.9)
Indeterminate		16	21	24	61	(5.8)
TOTAL	#	236	660	157	1053	
	%	(22.4)	(62.7)	(14.9)		

Table 2.14. Comparison of debitage from representative surface grid squares of Area S (N475 E475, N475 E500) and Area Ne (N575 E475, N600 E500).

A. Technological Class

	CORTICAL ELEMENTS			NON-CORTICAL ELEMENTS			Bif. Tr.	
	Flakes	Chunks	Th. Shatter	Flakes	Chunks	Th. Shatter	Flakes	TOTAL
Area S	40 (10.5%)	15 (3.9%)	4 (1.0%)	286 (74.9%)	25 (6.5%)	9 (2.4%)	3 (0.8%)	382
Area Ne	40 (14.7%)	16 (5.9%)	5 (1.8%)	188 (68.9%)	18 (6.6%)	5 (1.8%)	1 (0.4%)	273

B. Chert type

	Florence A	Florence B	Flint Hills Lt. Gray	Flint Hills Green	Cresswell	Alibates	Indeter-minate	TOTAL
Area S	180 (47.1%)	75 (19.6%)	35 (9.2%)	68 (17.8%)	15 (3.9%)	2 (0.5%)	7 (1.8%)	382
Area Ne	130 (47.6%)	45 (16.5%)	25 (9.2%)	57 (20.9%)	5 (1.8%)	- -	11 (4.0%)	273

C. Thermal Alteration

	THERMAL ALTERATION STATE			
	Unaltered	Altered	Damaged	Total
Area S	108 (28.3%)	210 (55.0%)	64 (16.8%)	382
Area Ne	90 (33.0%)	145 (53.1%)	38 (13.9%)	273

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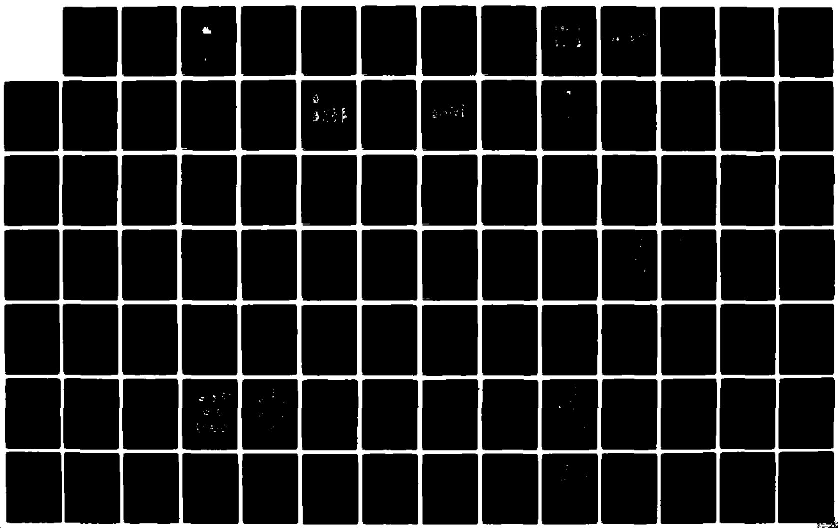

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1.0 1.1 1.25 1.4 1.6 1.8 2.0 2.2 2.5 2.8 3.2 3.6 4.0 4.5 5.0 5.6 6.3

MICROCOPY RESOLUTION TEST CHART

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between areas. If there were broad differences between the areas in lithic-technological activities, these differences were not reflected in proportions of surface-collected chert types, thermal alteration, or artifact classes.

Limestone

Limestone was recovered in abundance from both surface (Table 2.2) and excavation (Tables 2.3 and 2.4) contexts. For analysis, limestone was classified as "burned" and "unburned". Burning was evidenced by reddish surface discoloration, generally accompanied by chalky or crumbly surface textures.

For comparison, the ratio of burned to total limestone is shown in Figure 2.9, which is based on data provided in Table 2.15. Figure 2.9 shows that the highest concentration of burned limestone is on the west face of the abandoned levee, centering in grid squares N625 E450 and N625 E475. Over 60% of all limestone in this area was burned. These two squares coincide with Area Nw, suggesting that Area Nw is characterized not only by a higher frequency of limestone (Figure 2.8b) but also by high proportions of burned limestone. Comparatively, the frequency of burned limestone is much less in levee-crest Area Ne and levee-terminus Area S.

Limestone in archeological contexts, generally occurs in association with heat-generation facilities, such as hearths or roasting pits, or piles of refuse derived therefrom. The capacity of stones to absorb and store heat is of obvious utility for cooking and heating purposes. Exposure of limestone to heat results in changes in color and texture (mentioned above), and with repeated or prolonged exposure, the physical breakdown of the stones. As stones become smaller, they lose their heat storage capacity, necessitating the periodic cleaning of hearths and roasting pits. The utilization and maintenance of such facilities therefore generates quantities of small pieces of burned limestone which must be discarded. The distribution of burned limestone at 14BU4 suggests that the west face of the abandoned levee, centering on Area Nw, was a locus of limestone utilization and abandonment or simply of dumping of hearth cleaning refuse.

The only limestone feature known from 14BU4 is associated with Area Ne. Feature 2, recovered in 1974 from the eastern end of XU100 (Figure 2.2 above), was described by Fulmer (1976:57) as a "basin-shaped pit ca. 70 cm. in diameter," containing "fired limestone, burned earth and charcoal." This feature is similar to several features encountered by Leaf (1979:84-85) at 14BU31, a Plains Woodland site located two km. southwest of 14BU4, and interpreted by Leaf as roasting pits for cooking plant and animal foods.

Feature 2 was located in Area Ne. Including XU100 (two by 24 m.), the overburden removal from XU102 (eight by 10 m.), and the northern 25 m. of Trench A (25 by one m.) approximately 153 square meters of Area Ne has been excavated. Even though 105 square meters of this was by backhoe, the machine excavations were closely monitored by archeologists. If limestone filled features like Feature 2 had been encountered by the backhoe, they would have been detected. This suggests that the density of such features in Area Ne is no greater than 1 per 150 square meters. A minimal estimate of the area covered by the densest portions of Area Ne is 2500 square

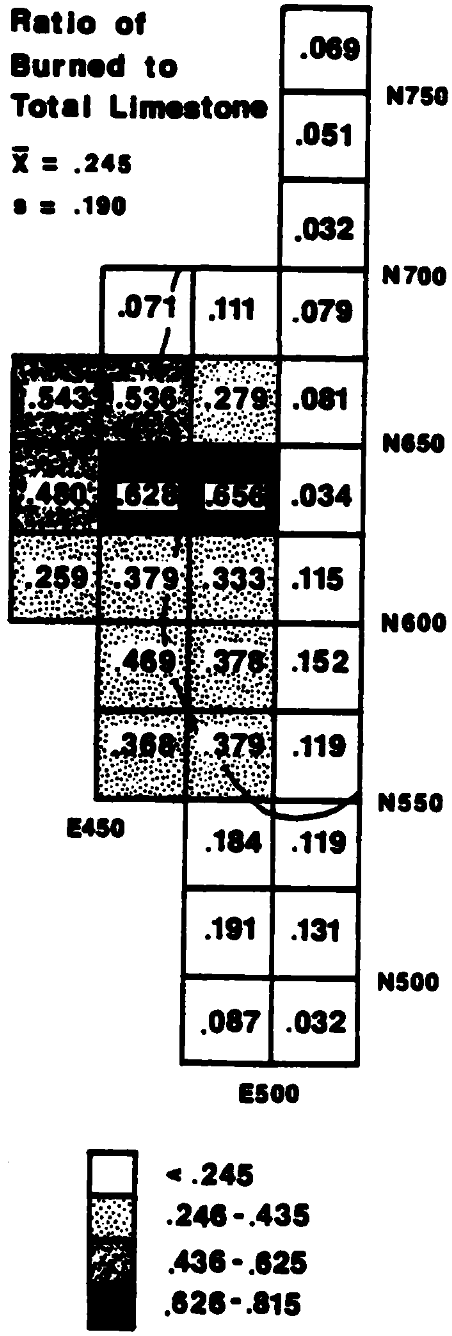

Figure 2.9. Distribution of burned limestone on surface of 14BU4, expressed as ratio of total limestone.

Table 2.15. Frequency of burned and unburned limestone in surface grid units at 14BU4.

Unit	Burning +	Burning -	Total	Unit	Burning +	Burning -	Total
N475E475	8	84	92	N625E425	12	13	25
E500	1	30	31	E450	130	77	207
N500E475	22	93	115	E475	40	21	61
E500	8	53	61	E500	2	57	59
N525E475	9	40	49	N650E425	19	16	35
E500	8	59	67	E450	15	13	28
N550E450	14	24	38	E475	12	31	43
E475	25	41	66	E500	5	57	62
E500	7	52	59	N675E450	1	13	14
N575E450	15	17	32	E475	1	8	9
E475	34	56	90	E500	3	35	38
E500	7	52	59	N700E500	1	30	31
N600E425	7	20	27	N725E500	2	37	39
E450	11	18	29	N750E500	2	27	29
E475	28	56	84				
E500	14	108	122	TOTAL	472	1275	1747

meters, an area bounded by grid lines E475, E425, N575 and N625. Given the above estimated density, there could be as many as 16-17 such features in Area Ne. This is a speculative estimate, but it does serve to suggest that a number of such features could have gone undetected in the area. The low frequency of burned limestone in Area Ne indicates that, if limestone roasting pits such as Feature 2 were used in the area, the hearth-cleaning debris from them was dumped elsewhere. It is very likely that the west face of the levee (Area Nw) was utilized for this purpose, since it is in this area that high frequencies of burned limestone were recovered.

Area S, at the southern end of the levee, exhibits low proportions of burned limestone. The presence of abundant faunal remains in XU101 suggests that cooking may have been accomplished in this area, possibly requiring the use of limestone, but no evidence for this use was found.

The frequency of burned and unburned limestone in XU102 and XU101 are presented in Table 2.16. The excavated data agree with surface indications of

Table 16. Frequency of burned and unburned limestone in excavated contexts at 14BU4.

Unit	Burned	Unburned	Total	Ratio B/Ttl.
XU101	71	704	775	.092
XU102	65	651	716	.091

low frequencies of burned limestone in Areas S and Ne. Neither XU101 or XU102 yielded evidence of the nature of limestone utilization within or in the vicinity of the units.

Faunal Remains

Total counts and weights of faunal remains from XU101, XU102 and the grid surface collection are shown in Table 2.17. These specimens are grouped according to whether or not they exhibit burning, and whether evidence of burning consists of charring (partial or complete surficial blackening) or calcining (white, brittle condition indicative of the complete oxidization of organic matter from bone). As seen by comparison of numbers and weights, much of the recovered bone consisted of small fragments. The fragmentary nature of the surface collected fauna precludes its detailed discussion, since the representativeness of surface samples of such small sized particles cannot be evaluated. No identifiable elements were recovered from surface proveniences.

The relative proportions of burned to unburned bone in XU101 and XU102 are surprisingly similar. Unburned specimens of bone were most abundant in both XU101 and XU102, accounting for 67.1% and 63.4% respectively, of the totals by count and 74.5% and 71.8%, respectively, by weight. Burned bone

Table 2.17. Faunal remains from the surface component of 14BU4.

PROVENIENCE	Unburned #	Unburned Wt. (gm.)	Charred #	Charred Wt. (gm.)	Calcined #	Calcined Wt. (gm.)	TOTAL #	TOTAL Wt. (gm.)
Grid Surface	56	77.4	3	0.8	66	20.9	125	99.1
mean		1.38		0.27		0.32		0.79
XU101								
Level 1	152	69.6	38	17.6	58	12.8	248	100.0
Level 2	145	88.5	39	17.5	33	7.4	217	113.4
Level 3	37	7.8	3	0.6	5	1.8	45	10.2
Level 4	25	2.8	-	-	-	-	25	2.8
TOTAL	359	168.7	80	35.7	96	22.0	535	226.4
mean		0.45		0.45		0.23		0.42
XU102								
Level 1	35	16.1	1	0.6	20	5.6	56	22.3
Level 2	10	3.5	1	0.4	4	1.1	15	5.0
TOTAL	45	19.6	2	1.0	24	6.7	71	27.3
mean		0.44		0.50		0.28		0.38

(combining charred and calcined categories) in XU101 accounted for 32.8% by count (25.5% by weight), compared to 36.7% by count (28.2% by weight) in XU102. In terms of proportions, the only significant difference between the two excavations is the much higher frequency of charred specimens in XU101 (n=80), relative to XU102 (n=2). Correspondingly, calcined bone was proportionally less frequent in XU101 than XU102.

The mean weights shown in Table 2.17 suggest that calcined bone fragments were, as a whole, smaller than charred and unburned fragments, probably reflecting the greater fragility of the completely burned, calcined elements. The fragmentary nature of the faunal assemblage has two plausible interpretations. Breakdown of the bone could have resulted from natural processes, the result of drying and cracking of bone exposed on the surface of the site, perhaps augmented by scavenger activity and trampling. Small bone fragments may also indicate the breaking up of long bones to obtain marrow for bone grease. The first alternative is supported by soil-geomorphic evidence of low depositional rates on the site. Bones deposited on the surface, and not buried in pits or rubbish heaps, would have remained exposed for long periods of time. The second alternative, however, cannot be dismissed, since XU101 yielded two spirally fractured distal ends of deer humeri, suggesting intentional breakage for marrow. Further analysis is required to evaluate these alternatives.

Identification of faunal remains has not been undertaken. Preliminarily, XU101 remains include deer, several sizes of turtle, and small carnivores (raccoon or mustelids).

Miscellaneous Materials

Ferrous oxide minerals were represented on the site by one piece of limonite (weight, 0.8 gm.) from the site surface and five pieces of hematite (total weight, 1.4 gm.) from XU101. No evidence of use, in the form of striations or facets, occurs on these specimens. No ferrous oxide minerals occurred in XU102.

Two sandstone artifacts were recovered from the gridded surface collection in Area S. Both possess flat, ground functional surfaces, and are probably fragments of grinding slabs. XU101 yielded seven small pieces of sandstone (total weight, 9.8 gm.), all of which were angular rubble, lacking remnant functional surfaces. XU102 also yielded seven specimens of angular sandstone rubble, one of which weighed 193 gm., while the remainder average less than one gm. apiece. In addition, XU102 yielded two sandstone artifacts with flat, ground surfaces, suggesting use as grinding slabs. The maximum dimensions of the fragmentary working surfaces were 12 cm. and four cm.

Burned earth was recovered in considerable quantities from excavated contexts, but was minimally represented in the surface collection (Table 2.18).

Table 2.18. Burned earth from the surface component, 14BU4.

Provenience	Burned Earth #	Burned Earth Wt. (gm.)	"Daub" #	"Daub" Wt. (gm.)	TOTAL #	TOTAL Wt. (gm.)
Surface (Area Ne)	2	1.7	-	-	2	1.7
XU101	554	202.2	3	3.5	557	205.7
XU102	72	41.0	1	1.5	73	42.5

Only small pieces of burned earth were recovered. A careful examination of this material revealed only four specimens which exhibited grass and stick impressions. The very low quantities of such material suggests that wattle and daub house structures were not present at 14BU4. Burned earth, instead, probably represents the use and maintenance of fires.

Shaped Tools

The surface component yielded 61 shaped tools and tool fragments, distributed among provenience units as shown in Table 2.19. Grouping of tools into Ne and S Areas follows the divisions apparent in Figure 2.8 above. Tools from the extreme northern end of the grid, beyond Area Ne, are discussed separately.

Table 2.19. Provenience of shaped tool categories from the surface component of 14BU4.

Provenience	Projectile Point	Light Cutting	Heavy Cutting	TOTAL
AREA S:				
Grid surface	2	3	-	5
XU101	12	13	-	25
AREA Ne:				
Grid surface	4	8	2	13
XU102	9	8	1	18

Three morphological categories of tools were recognized in the assemblage, termed projectile points, "light cutting tools," and "heavy cutting tools." All three categories exhibit considerable variation in form which makes more precise subdivision of the categories difficult, especially given the small sample sizes. In the case of the latter two categories, the morphological variability could imply functional diversity, a non-standardized tool production technology, and/or complex processes of tool maintenance and reuse. Differentiating these possibilities is not attempted here.

All tools from 14BU4 possess relatively acute working edges. This suggests their utility as cutting or butchering implements, although it is probable that some of the "light cutting tools" represent projectile point preforms (e.g., Figure 2.10f-g). Remaining forms of small (e.g., Figures 2.10h, 2.11e) and large (e.g., Figure 2.11f) tools are probably functional.

There is a complete absence in the Phase III excavated or surface assemblages of formally shaped scrapers and heavy-duty chopping or butchering tools. Although a few large choppers or celts appear in the 1977 surface collections, such artifacts do not appear to be important components of the assemblage. The 14BU4 assemblage thus lacks the diversity in tool types observed in collections from other Woodland sites of similar size in the El Dorado Lake area, notably 14BU9 (Leaf 1981) and 14BU55 (Adair and Brown 1981 and this volume).

Variability in projectile point morphology is interpreted here as representing stages of manufacture, maintenance, and use. Manufacturing at the site is indicated by a partially shaped point from XU101. This artifact (Figure 2.10c) was discarded after only minimal lateral modification and an abortive attempt at stem preparation by notching.

Six projectile points exhibit transversely or obliquely oriented breaks which suggest mechanically induced breakage. Whether breakage occurred during manufacture, or maintenance is not known, although the finished form of all artifacts included in this category suggests that breakage resulted after completion of manufacture.

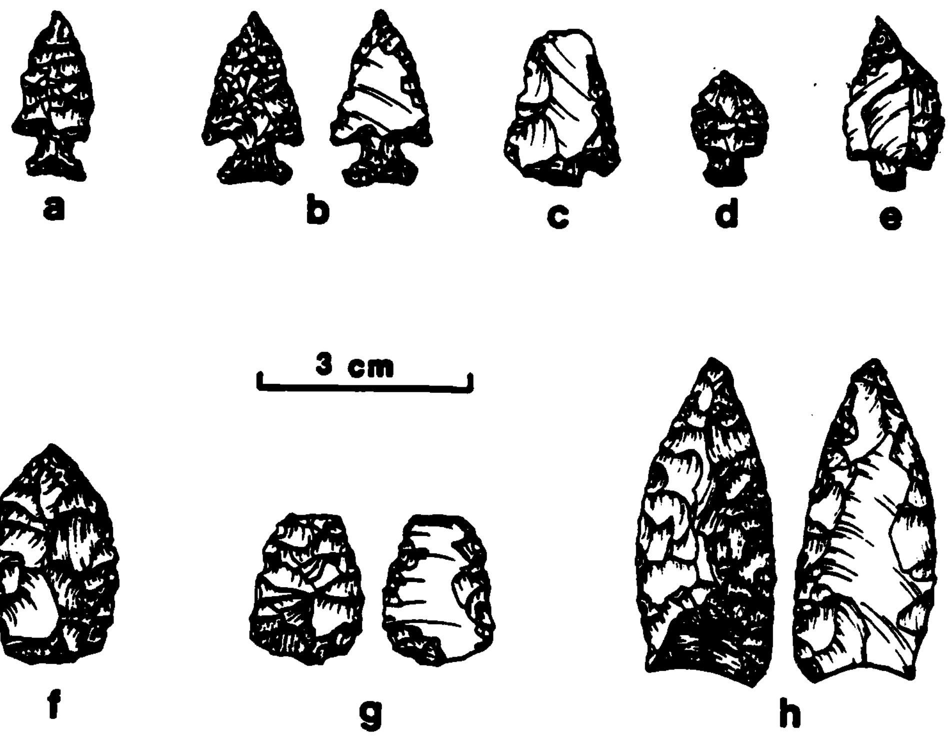

Figure 2.10. Shaped tools from Area S.

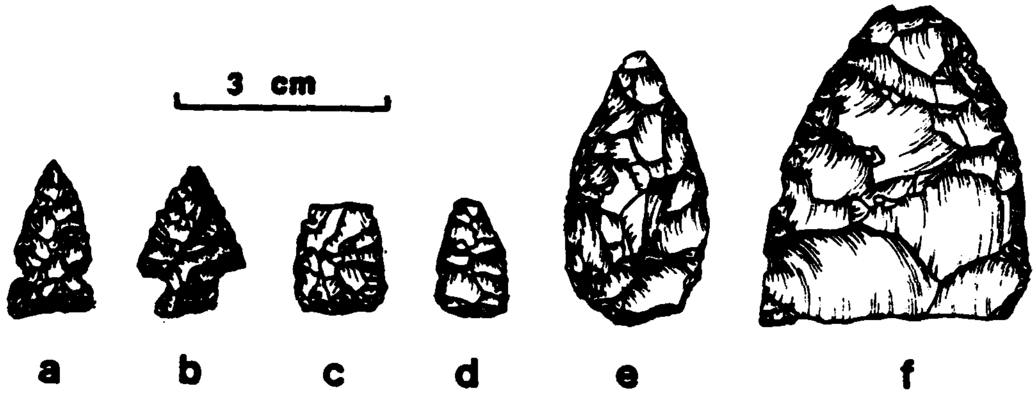

Figure 2.11. Shaped tools from Area Ne.

Eight points were complete in outline morphology, although three of these possessed only a single completely flaked surface (e.g., Figure 10b). There is no a priori reason to classify these latter as manufacturing rejects since they possess fully functional outlines and shapes.

Two points from XU101 and one from XU102 represent the maintenance or reuse of projectile points. One of these (Figure 2.10d), from XU101, represents the progressive resharpening of the point's blade to a short remnant. The other two specimens (e.g., Figure 2.11d) represent the basal reworking of stemmed or corner notched points by means of steep retouch along the broken base of the tool. The purpose of this reworking is not known.

Two artifacts classified as projectile points are simply small flakes, shaped with minimal effort to a triangular form. One (Figure 2.10e) was further furnished with a stem.

The remaining seven artifacts grouped as points are miscellaneous fragments, all weighing less than one gram. These include several "tail" fragments of stemmed points.

The above descriptions of projectile points are summarized in Table 2.20 which shows the distribution of the categories among provenience units.

Table 2.20. Data on projectile points from the surface component of 14BU4.

	AREA S		AREA Ne	
Category	Grid Surface	XU101	Grid Surface	XU102
Partially-shaped	-	1	-	-
Mechanical Failure	-	1	2	3
Complete	2	3	2	1
Reworked	-	2	-	1
Ad-hoc	-	1	-	1
Misc. Fragments	-	4	-	3
Total	2	12	4	9

Although the sample is small, the table shows that only excavations yielded the full range of recognized groups. Only complete points and those broken by mechanical failure were recovered from the surface. XU101 yielded a few more complete points, while points broken by mechanical failure were more frequent in XU102. Reworked and ad hoc tools were present in both units.

Projectile points were all of a small triangular form, generally inferred to have tipped arrows. Of the projectile points exhibiting complete or identifiable hafting elements, all but three were stemmed, representing a form suggestive of the "Scallorn" type. Two side-notched and one unnotched form were also recovered. The latter three were recovered from Area Ne. Only stemmed points were recovered from Area S. The somewhat greater

diversity in projectile points in Area Ne relative to Area S is also reflected by general tool diversity; only Area Ne yielded heavy cutting tools (Table 2.19).

The greater variety of tool forms recovered in Area Ne indicates that a greater range of activities were performed, or that Area Ne was subject to a longer span of occupation (or to more numerous reoccupations). These alternatives are not mutually exclusive, since longer occupation span generally provides a greater opportunity for a diverse array of activities to be accomplished and for their debris to accumulate on the site surface.

Ceramics

A total of 67 sherds were recovered from Phase III investigations at 14BU4. All sherds with preserved exterior surfaces are cordmarked. Indurated clay was the predominant temper type in the assemblage (Table 2.21).

Table 2.21. Temper types of ceramics from 14BU4, surface component.

Temper	Area S Grid Surface	Area S XU101	Area Ne Grid Surface	Area Ne XU102
Indurated Clay	2	28	8	10
Sand	-	2	-	-
Limestone	-	1	1	-
Bone	-	-	3	2
TOTAL	2	31	12	12

Cordmarked, indurated clay ceramics in the El Dorado Lake area indicate affiliation with Plains Woodland, elsewhere dated from ca. 1000 to 1500 B.P. (Johnson, in press). As shown in Table 2.21, bone tempered ceramics were recovered only from Area Ne, while sand tempered sherds were recovered only from XU101 in Area S. Two limestone tempered sherds were recovered from Area Nw.

Summary

Based on the analysis of systematic surface collections, augmented by excavated data, it is possible to suggest that intra-site patterning observed in the surface component of 14BU4 is due to functional differentiation of activities on the site. This differentiation is most clearly seen in the distribution of chipped stone and limestone, the two most abundant materials recovered. Area S, at the southern terminus of the abandoned levee, was dominated by chipping debris, with subdominant proportions of limestone. Area Nw, on the levee's west face, was dominated almost exclusively by limestone, while Area Ne, on the levee crest, had approximately equivalent proportions of both.

Burned limestone was concentrated on the western face of the levee, including Area Nw. This suggests that the west face of the levee served as the discard context for debris generated by the use and maintenance of limestone cooking/heating facilities. Whether such facilities were operated in Area Nw is not known; however, Feature 2, in XU100, demonstrates that such facilities were present in area Ne. A likely dumping spot for refuse from such features would have been the west face of the levee.

An analysis of chipped stone from XU101 suggests that thermal alteration of chert was accomplished in the immediate vicinity of the excavation, in Area S. The presence of partially shaped and reworked projectile points in XU101 is further evidence of lithic-related activities in Area S. The presence of bone and limestone suggests that cooking and butchering (also evidenced by small cutting tools) may have been accomplished in the area. Burned earth, abundant in XU101, could have been produced in the course of either thermally altering chert or cooking.

Area Ne, on the levee crest, was dominated by neither chert debris nor limestone. Bone was recovered from XU102, indicating butchering and cooking activities. Butchering activity is further evidenced by a variety of cutting tools. Area Ne is primarily differentiated from the other two areas of 14BU4 by the diversity of materials recovered there. Area Ne yielded heavy cutting tools, not found in Area S. It yielded side-notched and unnotched projectile point forms, in addition to the stemmed forms which were found in Area S.

Area Ne yielded bone tempered ceramics, not observed in the other areas. Although Area S yielded sand-tempered sherds not found in Area Ne, these sherds were from XU101 and could well represent a single vessel. Importantly, bone tempered ceramics in Area Ne occur in both excavated and surface contexts, thus offering plausible evidence of a slightly greater ceramic diversity.

The excavated lithic assemblage from XU102, in Area Ne, was differentiated from XU101, in Area S, by lower frequencies of thermal damage, and by a more generalized selection of chert materials (relative to XU101, where a single chert type, Florence A, dominated the assemblage). This variability between excavations, however, does not extend to surface collected lithics from the two areas, and thus its implications are difficult to discern. One possibility, however, is that Area S is composed of a number of small areas, where activities focused on a few chert types, probably during single episodes of knapping. These individual areas were too small to be detected by use of a 25 m. grid unit. Area Ne, on the other hand, may represent a generalized accumulation of chipping debris, accumulating over a longer, or more intensive series of reoccupations.

It seems plausible that Area Ne was that portion of 14BU4 in which the site's Woodland occupants participated in the widest range of activities, possibly over a longer period of time, or a greater number of reoccupations. Although evidence for this hypothesis is not wholly conclusive, its plausibility is supported by a consideration of geomorphic context. Situated on the crest of the abandoned levee, Area Ne presented a well-drained surface (as documented by soil-geomorphic studies) which was probably attractive as

a camping location. It thus may have been consistently selected by prehistoric hunter/gatherers returning to the area, gradually accumulating a diverse variety of habitation debris. Less optimal landscape positions adjacent to the levee crest were used for functionally specific purposes. Area S, at the southern tip of the levee, may have been a lithic work area; Area Nw and the levee's west slope may have served as a dumping area for limestone.

A seasonal, non-sedentary occupation of the site is indicated by the lack of evidence for durable wattle and daub structures, the almost exclusive representation of tools useful in hunting (projectile points; preforms) and butchering (acute-edged cutting tools), and the absence of formalized wood or hide-working tools. Plant-food processing is evidenced by fragments of flat surfaced sandstone slabs. Extractive, as opposed to maintenance, tasks seem to be indicated by the assemblage.

The objective of these tasks is not known, pending analysis of faunal and floral remains from the site. Occupation of the levee would, however, have placed prehistoric groups in proximity to a variety of riverine resources.

The Archaic Component

Areal Extent

Three backhoe trenches and two two by two m. test units were excavated to detect the site's buried Archaic component. Neither test unit revealed buried materials. Of the backhoe trenches, only Trench A encountered cultural deposits. The discovery of a thin stratum of 14 flakes between N589 and N596 guided the placement of XU102, a 36 square meter block excavation. As shown in the site map (Figure 2.2 above), XU102 represents an eastern continuation of XU100, the 1974 test trench.

Phase III excavations indicate that the buried component's southern edge lies between XU102 and XU103, probably extending not more than a few meters from XU102, as indicated by the extent of the deposit in Trench A. Based on Fulmer's test trench (XU100) and XU102, the deposit extends for at least 30 m. east-west. Northern boundaries are not known, although the site is truncated on the northwest by the terrace edge.

Cultural Stratigraphy

The Archaic cultural stratum, as detected in XU102, consisted of a relatively thin stratum of artifacts, primarily chipping debris. The stratum was defineable solely by artifact loci; no natural stratigraphy was apparent in the clayey AC horizon of the paleosol. Most of the deposit occurred in Levels 5 and 6, between 2.15 and 2.35 m. below datum (1.35 to 1.55 m. below surface).

Three dimensional plotting of all specimens two cm. or larger in size revealed that the cultural deposit conformed to a surface sloping downward toward the south. Based on data provided by William (personal

communication), a regression line fitted to the vertical distribution of artifacts along a north-south transect intercepted the y-axis (N592) at 2.3469 BD (bottom of Level 6), with a slope of -0.0183. This line intercepted the opposite side of XU102 (N598) at 2.17 m. BD (top of Level 5), indicating that the stratum sloped 15-20 cm. downward to the south in the six m. linear distance of XU102.

The low correlation coefficient (r=0.5235) is partially attributed to a slight westward component to the downward slope, apparent in vertical scattergrams of artifacts along east-west axes. The dispersion also indicates vertical displacement of artifacts by rodent activity and pedoturbation (primarily induced by the high shrink-swell capacity of the clayey sediment matrix). Despite these factors, the deposit was rather tightly contained within Levels 5 and 6. As shown in Table 22, 90% of the prehistoric specimens from XU102 (2563 of 2832) were recovered from

Table 2.22. Inventory of materials recovered from Archaic levels, Xu102.

Material	3(1.95[1])	4(2.05)	5(2.15)	6(2.25)	7(2.35)	TOTAL
Shaped Tools	1	-	6	3	-	10
Chipped Stone	10	132	1180	1135	87	2544
Fire-cracked Cobbles	-	24	128	52	6	210
Quartzite	-	-	12	2	-	14
Limestone	-	-	5	2	1	7
Hematite	-	3	4	13	-	20
Burned Earth	-	1	1	6	-	8
Charcoal	-	1	3	2	-	6
Bone	-	-	1	8	3	12
Gravel	1	-	15	16	14	46
TOTAL	12	161	1355	1239	111	2878
TOTAL PREHISTORIC (minus gravel)	11	161	1340	1223	97	2832

[1] represents top of 10 cm. level, meters below 1980 datum

Levels 5 and 6. This strongly suggests that the component consists of a single stratum deposited on a sloping land surface, and then buried.

The 1974 trench was excavated in two by two m. provenience units, using 10 cm. levels. Screening was not employed, nor was three dimensional plotting. Despite the lack of precise artifact location data, it is apparent from the distribution of materials in XU100 that the cultural deposit was concentrated within a relatively thin stratum, at approximately equivalent depths below the 1979 reference level (Table 2.23).

Temporal Placement

Neither XU100 nor XU102 yielded sufficient quantities of dateable

Table 2.23. Inventory of materials recovered from Archaic levels of XU100.

Material	Level 15(2.03[1])	16(2.13)	17(2.23)	18(2.33)	TOTAL
Shaped Tools	1	2	3	-	6
Chipped Stone	8	61	2946	113	3128
Limestone	-	-	-	1	1
Burned Earth	-	1	2	-	3
Bone	-	-	2	-	2
Gravel	2	1	2	4	9
TOTAL	11	65	2954	118	3149
TOTAL PREHISTORIC (minus gravel)	0	64	2452	114	3140

[1]Below datum calculated in meters below 1979 reference level; this number represents top of 10 cm. level.

organics for radiocarbon assay. Artifacts recovered from both excavations are similar to those described by Grosser (1970, 1973) from the Chelsea phase levels of the Snyder site, 14BU9. Stratigraphic similarities of the components support Fulmer's (1976) inference of contemporaneity since both the Chelsea phase levels at 14BU9 and 14BU4's Archaic component occur in the lower horizons of a paleosol. A Late Archaic stratum in a stratigraphically similar situation was encountered at the Milbourne site, 14BU25 (Root, this volume). An analysis of hafting element morphology suggests that 14BU4's projectile points fall within the range of similar tools from 14BU25 (Root 1981). It is suggested that 14BU4's deposit is approximately contemporaneous with 14BU9's Chelsea deposits (i.e., pre-4000 B P; Grosser 1973), and 14BU25's component, radiocarbon dated at 4435 ± 35 B P (Root, this volume).

Material Recovered

Chipped Stone

XU102 yielded an assemblage dominated by chipped stone debitage, comprising 89.8% (2544 of 2832) of the total prehistoric artifacts (Table 2.22). As shown in Table 24 non-cortical products of reduction comprised 94.8%

Table 2.24. Heat treatment of chipped stone categories from the Archaic levels of XU102.

Technological Class	Unaltered	Altered	TOTAL
Cortical Elements	47	56	103
Noncortical Elements	436	1975	2411
Bifacial Trim. Flakes	-	2	2
Thermoclastic Shatter	-	28	28
TOTAL	483	2061	2544

(2411 of 2544) of the chipped stone, with fewer numbers of cortical elements (n=103), and even fewer bifacial trimming flakes (n=2). Twenty-eight specimens of thermoclastic shatter (potlids and thermal spalls) were recovered. No complete cores or angular rubble (chunks and shatter) were recovered.

Thermally altered specimens account for 81.0% (2061 of 2544) of the debitage. Almost half of the cortical elements were thermally altered (56 of 103), while 81.9% of the non-cortical elements were thermally altered (1975 of 2411).

XU100 yielded a lithic assemblage similar to XU102 in terms of the relative propotions of technological classes and thermal alteration (Table 2.25). As in XU102, no chert types other than Florence A were observed in the XU100 assemblage.

Table 2.25. Technological classes and thermal alteration state of chipped stone debitage from Archaic levels, XU100.

Technological Class	Unaltered	Altered	TOTAL
Cortical Elements	18	73	91
Non-cortical Elements	496	2571	3067
Bifacial Trim. Flakes	-	7	7
Thermoclastic Shatter	-	4	4
TOTAL	580	2589	3169

Fire-cracked Cobbles

These specimens, recovered only from XU102, consisted of small (less than three cm.) fragments of alluvial chert cobbles. Exposure to heat is evidenced by dark reddish discoloration and thermally induced fractures, such as potlidding and crazing. All of these artifacts occurred within a two m. diameter area of XU102 centering on N595 E501. It is probable that only a few individual cobbles are represented. No evidence of in situ burning was associated with the artifacts.

Quartzite

Angular fragments of quartzite were also recovered in the same general area as the fire-cracked cobbles. The quartzite is a coarse-grained material, similar to small quartzite concretions associated with the Herington member of the Nolans limestone, a Permian limestone which outcrops in the uplands west of the El Dorado Lake area (Haury 1981). Evidence of thermal damage was not noted. No quartzite occurred in XU100.

Bone

Faunal remains from XU102 were small, unidentified fragments of larger bones. All are calcined, indicating burning. Whether breakage occurred culturally or naturally is not known. Interestingly, bone was also recovered from a restricted area centered in N595 E500, adjacent to the concentrations of fire-cracked cobbles and quartzite.

Two bone elements were recovered from XU100. Neither was calcined. One is unidentifiable, while the other is the ilium of a small frog or toad. Both bones are in relatively good condition, compared to the calcined, brittle specimens from XU102. It is possible that they are intrusive.

Hematite

Small fragments of hematite were recovered from a restricted area including N595 E503 and N595 E504, in XU102. The surface of one fragment was covered with narrow, parallel, and closely-spaced striations. XU100 yielded no hematite.

Limestone

Seven small pebbles of limestone were recovered from XU102, and one from XU100. None evinces thermal discoloration. Although these artifacts are counted as prehistoric debris, assuming use in hearths or roasting pits, it is also possible that the pebbles were naturally introduced.

Burned Earth and Charcoal

Small flecks of these materials occurred throughout XU102, but only 14 specimens were large or durable enough for collection. The origin of this material is not known. No concentrations of burned earth and charcoal were apparent. Only three pieces of burned earth and no charcoal was collected from XU100. No observations regarding presence or absense of these were recorded during the 1974 excavations.

Shaped Tools

Ten shaped tools were recovered from XU102, including three projectile points, two ovate biface fragments, four biface fragments, and an endscraper. All tools were of Florence A chert. All but two were thermally altered.

Two of the three projectile points are shown in Figure 2.12a-b. The points are triangular in outline, with thick broad stems. One of these (Figure 2.12a) shows evidence of reworking making the blade noticeably thinner than the haft. This suggests that reworking was done while the point was hafted, and thus that the point was broken or dulled during use. The presence of an impact fracture at the point's tip indicates that its last use may have been as a projectile. The second point (Figure 2.12b) was

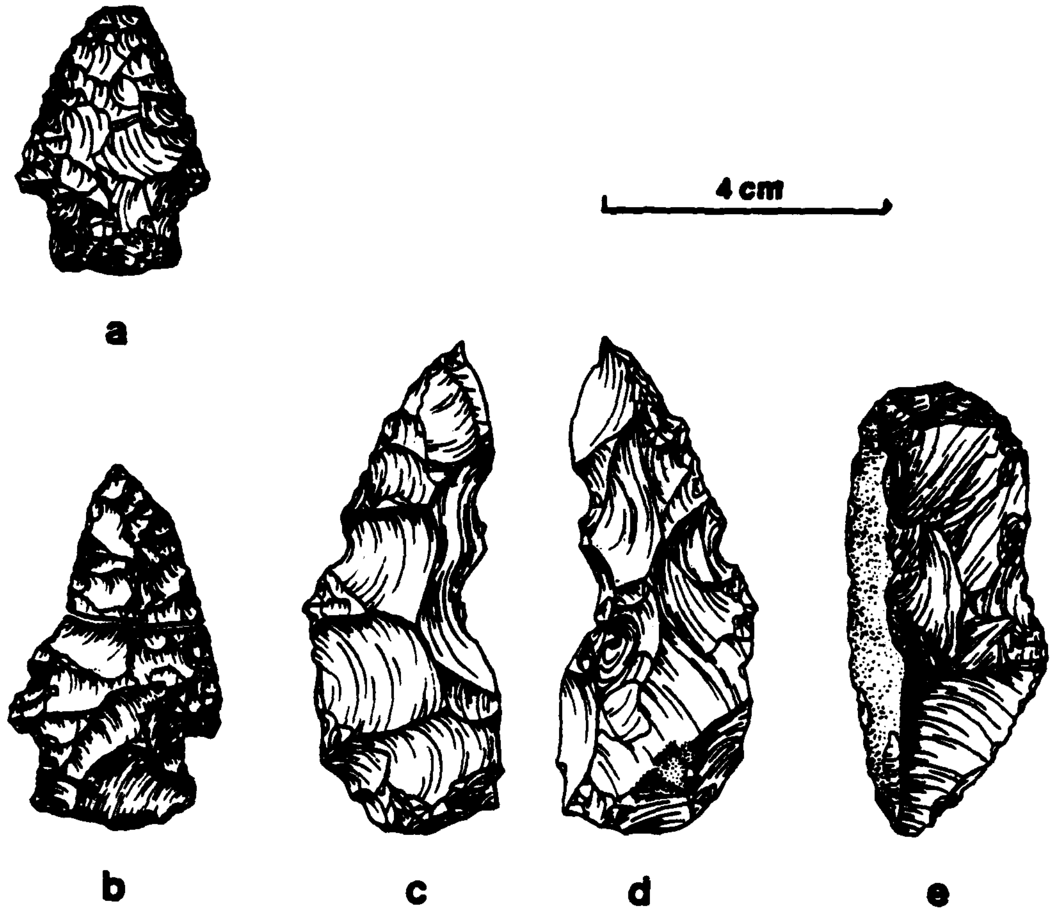

Figure 2.12. Shaped tools from Archaic levels of XU102.

recovered in two sections from XU102, separated 102 cm. horizontally and six cm. vertically. The asymmetrical left margin (Figure 12b) suggests that breakage occurred in the process of reshaping the blade element. The third projectile point (not illustrated) is a thermally fractured hafting element. The single preserved notch is similar to that exhibited by Figure 2.12b.

One of the two ovate bifaces recovered from XU102 is of approximately the same size as the largest projectile point, suggesting that the biface represents a point preform. The biface exhibits a lateral snap, indicative of breakage during manufacture. It is not thermally altered.

The second ovate biface (Figure 2.12c-d) exhibits severe thermal damage The size and depth of the flake scars on the single intact surface (Figure 2. 12c) suggests that the artifact may have served as a core. Whether additional functions were intended is not known.

A single endscraper (Figure 2.12e) is fashioned on a long, prismatic blade of unheated Florence A chert. Steep retouch is present at the flake's distal end. Large flake removals along the dorsal surface of the flake suggest that is was either removed from a core, or used as a core for flake production.

Shaped tools recovered from XU100 (Figure 2.13) include one projectile point, four biface fragments, and a unifacial cutting tool. The projectile point (Figure 2.13a), like that in Figure 2.12a was discarded only after considerable reworking of the blade and breakage of the tip by impact. The biface fragments may represent preforms (Figure 2.13b). Flake scars on the nearly complete biface in Figure 2.13c are sufficiently large to suggest that the biface may have served as a core. The unifacial cutting tool (Figure 2.13d) is similar to XU102's end scraper in being fashioned on a thick, large prismatic blade. Steep retouch occurs on one lateral margin; the obverse side of the opposite margin (not illustrated) is retouched to form (or maintain) an acute cutting edge. The tool may have served a dual purpose in scraping and cutting; steep retouch may also have facilitated prehension for use of the cutting edge.

Spatial Patterns

Excavation of XU100 and XU102 revealed a number of spatially discrete concentrations of materials. Figure 2.14 shows the distribution of prehistoric debris in combined levels of the two excavations. Three concentrations are visible in XU100: between 122W and 118W; between 116W and 112W; and between 110W and 108W. The latter of these contained Feature 6, which Fulmer (1976:57) describes as "a concentration of several hundred [actual number: 2312] chert flakes...approximately 8 cm. in depth and 1 meter in diameter."

XU102 revealed at least two clusters of materials. One of these lies at the western edge of XU102 and was truncated by Trench A. The other, which may have been nearly completely recovered, centers on squares N594 E504 and N595 E504. The increased material density in the southeastern square (N592 E505) suggests that the edge of a third concentration, lying

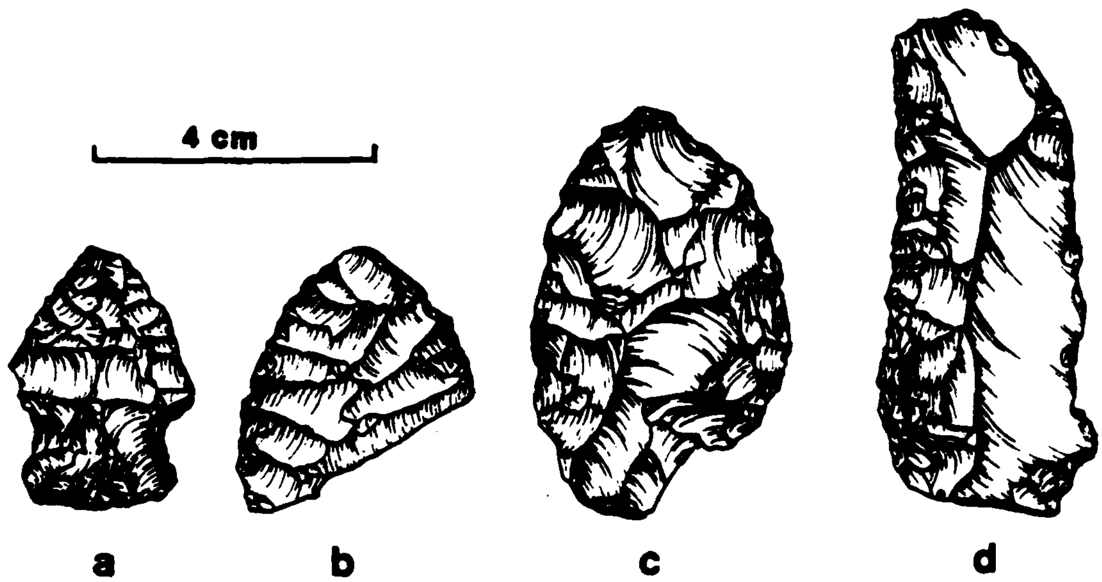

Figure 2.13. Shaped tools from Archaic levels of XU100.

southeast of XU102, may have been encountered.

Although the concentrations in XU102 may appear to be more dense than those in XU100 (with the exception of Feature 6), the lower densities in XU100 most likely reflect recovery bias, since screening was not employed in 1974. The concentrations shown in Figure 2.14 for XU100 probably reveal actual modes in the density distribution, but because of the differences in recovery techniques, are not directly comparable in a quantitative sense to those in XU102.

All concentrations are defined primarily by chipping debris. All also include shaped tools. The westernmost concentration in XU100 yielded a projectile point and two bifaces. A biface fragment was recovered from XU100's center concentration, from square 112W 100N (referring to the southeast corner, according to the 1974 provenience system). A biface fragment occurred near Feature 6. In XU102, two biface fragments, an endscraper, and a projectile point fragment were recovered from the western concentration, while two projectile points occurred in the eastern concentration.

In XU102, hematite was associated with the eastern concentration. Bone was recovered primarily from N595 E500, in the western concentration. Fire-cracked cobbles and quartzite occurred in an intermediate position between the two major concentrations, centering on N595 E501, where 75 of the total 88 artifacts were of these two categories. Fire-cracked cobbles outnumbered chipping debris in only four squares, forming a four square meter cluster between the two major concentrations: N595 E501, N595 E502, N596 E501, and N596 E502. Interestingly, all thermally fractured chipped stone and potlids occur in N595 E500 and N595 E502.

Materials other than chipped stone were too poorly represented in XU100 to allow discussion of their distribution. A careful search of collections from the 1974 excavations revealed no quartzite, hematite, or fire-cracked cobbles; Fulmer (1976), and unpublished field and laboratory notes from the 1974 dig make no mention of these materials being recovered, lost, or discarded. Why the other categories are so poorly represented in XU100 is not known.

Activity Analysis

The primary activity recorded in 14BU4's Archaic cultural deposit is lithic reduction. As indicated in Tables 2.24 and 2.25, the lithic assemblages from both XU100 and XU102 show little diversity. Chipped stone debitage and tools were fashioned of only one chert type (Florence A) and were predominantly thermally altered. The relatively low incidence of cortical elements indicates that most of this chert was initially prepared prior to being brought into the area of the excavations. The relatively low incidence of thermally damaged specimens indicates that most of the chert was heat-treated before transport into the area. Thus, chert seems to have been brought into the site in a "ready to use" form. Although further analysis of debitage from the component is required to be certain, this form may have been either bifacial blanks, like those in Figure 2.13c, and/or large flakes or blades, like those used as unifacial tools (Figure 2.12e and Figure

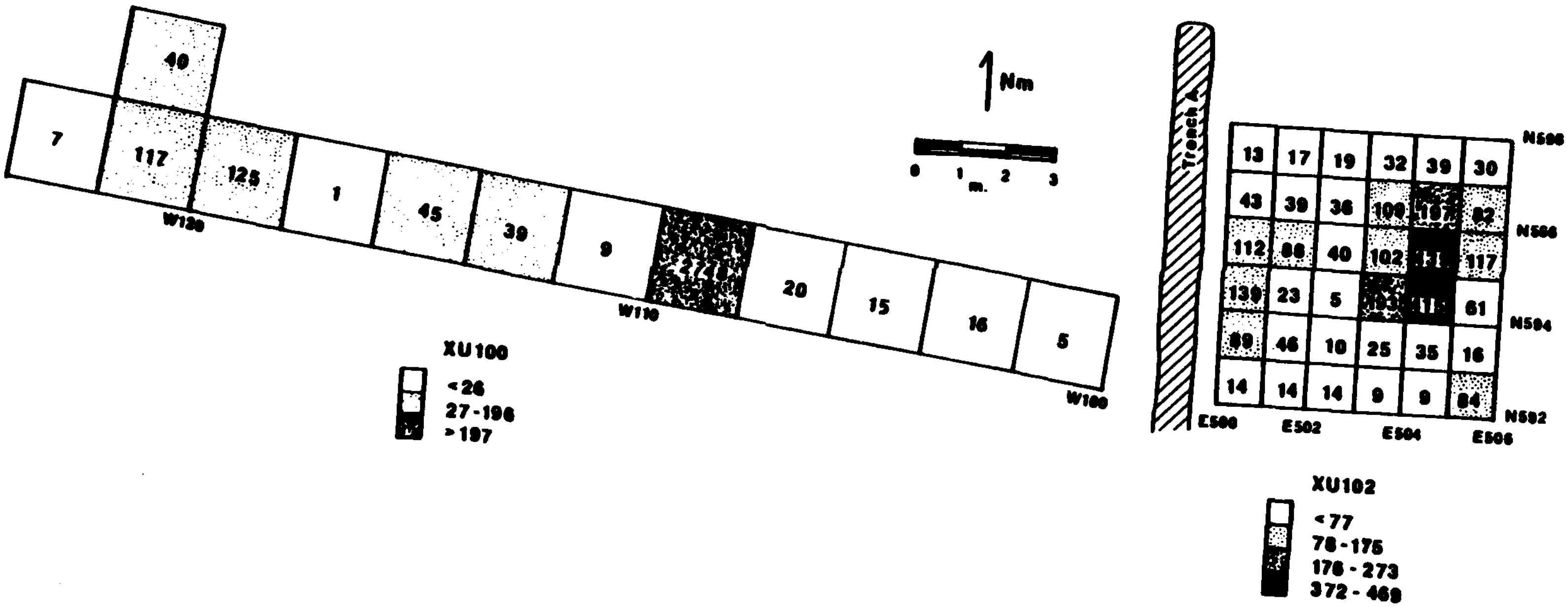

Figure 2.14. Distribution of prehistoric materials in the Archaic levels of XU102 and XU100.

2.13d).

Given the presence of preforms, projectile points may have been manufactured at the site. Projectile points were certainly reworked at the site, as two extensively reworked points indicate. Bifacially flaked objects were probably used as cores.

The presence of projectile points suggests that hunting was a primary goal of the Archaic people using 14BU4. Reworking of projectile points may have been required either to resharpen broken points or to resharpen edges dulled by use in butchering. Either task would fit into a hunting itinerary.

Hematite was used, as indicated by a striated piece. Two suggested functions are for pigment, or as abraders to round the edges of tools or flakes prior to edge removal.

Although fire-cracked cobbles, burned bone, burned earth, charcoal, and thermally-fractured chert indicate the on-site maintenance of fire and possibly meat roasting (burned bone), no evidence of hearth structures or fired areas were found. Small, open fires, without pits or hearth structures may have been maintained. The concentration of burned and thermally fractured materials in the area between the two main concentrations in XU102 may indicate such a feature.

Activity was localized in the Archaic component to small areas, five of which were detected by excavation. These areas are small. The most completely excavated, the western concentration in XU102, is approximately three m. in diameter (Figure 2.14). It is probable that each of these clusters of chipping debris, and broken and worn-out tools represent single episodes of activity by two or three individuals.

The low diversity of chert types and technological by-products represented in the component argues for a short-term, and probably single occupational episode, since further visits to the site would have increased the chances of other materials being introduced or other tasks being performed. In addition, the integrity of the stratum suggests that the cultural deposit was buried soon after its abandonment. This would suggest that the numerous concentrations of chipping debris were all deposited at approximately the same time, probably by a single group. The exact length of time available is unknown.

Summary

The Archaic component at 14BU4 is interpreted as a short-term, probably single occupation by a group of Archaic hunter/gatherers, at some time around 4500 B.P. This occupation resulted in the development of at least five spatially discrete deposits of chipping debris. The site's occupants maintained and possibly manufactured tools, and brought with them a considerable supply of Florence A chert, which was largely thermally altered and trimmed of cortex prior to arrival at the site. The main objective of the group was hunting; this required the maintenance of projectile points. Small open fires may have been maintained. Burned bone

suggests that meat was probably cooked and consumed. The component then represents a task-specific locus of people who operated from a base camp located elsewhere in the southern Flint HIlls.

Summary and Conclusions

Phase III investigations at 14BU4 contribute significantly to the understanding of prehistory in the El Dorado Lake area by providing data for a behavioral analysis of the site's two components. Investigations in both the upper and lower components of the site successfully distinguished intra-site spatial patterns. An analysis of these patterns suggests the kinds of activities that characterized areas of the site, as well as the site as a whole.

The surface component represents a series of occupations by Plains Woodland groups, who consistently selected the well-drained crest of an abandoned levee as a suitable site for habitation. In the course of this non-sedentary, probably seasonal habitation, debris accumulated not only on the levee crest, but also on off-crest areas less suitable for campsite location but serving well as loci for task-specific activities and refuse dumping.

The surface component at 14BU4 exemplifies prehistoric use of a specific land feature and suggests that prehistoric inhabitants of the Walnut River Valley were conscious of terrain variability. It also is possible that the levee was in close proximity to biotically rich back-water areas, a further attraction to habitation. This association of sites with geomorphic features contributes to the understanding of prehistoric site locational strategies.

The buried Late Archaic component at 14BU4 represents a short-term occupation by a small group of hunters who used the site for a brief episode of flint knapping, most likely for the purpose of making and curating hunting tools. Estimated to be approximately 4500 years old, the component is one of only four contemporaneous manifestations known for the El Dorado Lake area. The others include 14BU25, located on Durechen Creek and interpreted by Root (1981) as a base camp; 14BU9, where Grosser (1973) defined a contemporary component as representing the Chelsea phase; and 14BU81, which appears on the basis of limited test excavation to be a component remarkably similar to 14BU4 (Artz 1981). The analysis of 14BU4's Archaic component contributes to the understanding of this little known time period.

It is believed that Phase III investigations at 14BU4 have adequately mitigated the effects of inundation. A considerable amount of artifacts and data have been collected as a result of the investigations reported here. Records of the excavation, and the materials recovered will be curated at the University of Kansas Museum of Anthropology. Even after the site's loss, these records and remains retain their potential for contributing to the understanding of prehistory in the southern Flint Hills of Kansas.

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CHAPTER 3

EXCAVATIONS AT THE MILBOURN SITE (14BU25)

Matthew J. Root

Site Description

The Milbourn site is located within the El Dorado Lake project area along the south side of Durechen Creek, 4.8 km. northeast of its confluence with the Walnut River (Fig. 3.1). The main area of cultural deposit is buried in a stream terrace along the valley edge, beginning approximately 105 m. from the creek and extending south 100 m. In this locality, cultural debris is overlain by 1.2 to 1.5 m. of artifactually sterile deposit and extends to depths of 2.2 to 2.5 m. below present ground surface. Artifacts are eroding out of the banks of a gully which runs along the valley edge. Just west of the site, the gully turns north and flows into Durechen Creek. A thin scatter of chert artifacts extends into the upland prairie, terminating 280 m. south of Durechen Creek. Cultural debris is exposed in the banks of the gully from a point 35 m. east of where it turns north to a point 100 m. further east. Artifacts have been recovered from the bottom of the gully north of the bend, but these are washed in from upstream. The site probably extends farther east than artifact distribution in the gully indicates but downcutting has not yet exposed cultural deposits in that area (Figs. 3.2 and 3.3).

Radiocarbon Date

A single radiocarbon date has been obtained from the Milbourn site: 4435 ± 100 radiocarbon years: 2485 B.C. (UGa-2806) (half-life 5730). This assay was obtained from 50.6 gm. of wood charcoal recovered from feature 5 of the 1970 excavations (see below). This date is in conflict with the previously postulated temporal position of 14BU25, which was 1000 B.C. to A.D. 1 (Grosser 1977). However, the cultural deposit underlies a paleosol which is buried within the first terrace of the upper Walnut River system (Artz 1980). This is stratigraphically similar to the Snyder site Chelsea phase deposit, suggesting contemporaneity. Radiocarbon assays date the Chelsea phase at sometime after 2800 B.C. and before 2030 B.C. (based on radiocarbon dates with half-life 5568); stratigraphic reversals of two dates preclude more precise dating of the Chelsea phase (see Leaf 1979a; Table 1.1). However, stratigraphic similarity supports the date of 2485 ± 100 B.C. for the Milbourn site, not dates ranging from 1000 B.C. to A.D. 1

Excavations

14BU25 has been the subject of field investigations during six summers; all conducted by the Museum of Anthropology, University of Kansas. The site was originally surveyed and recorded in 1967 and a small

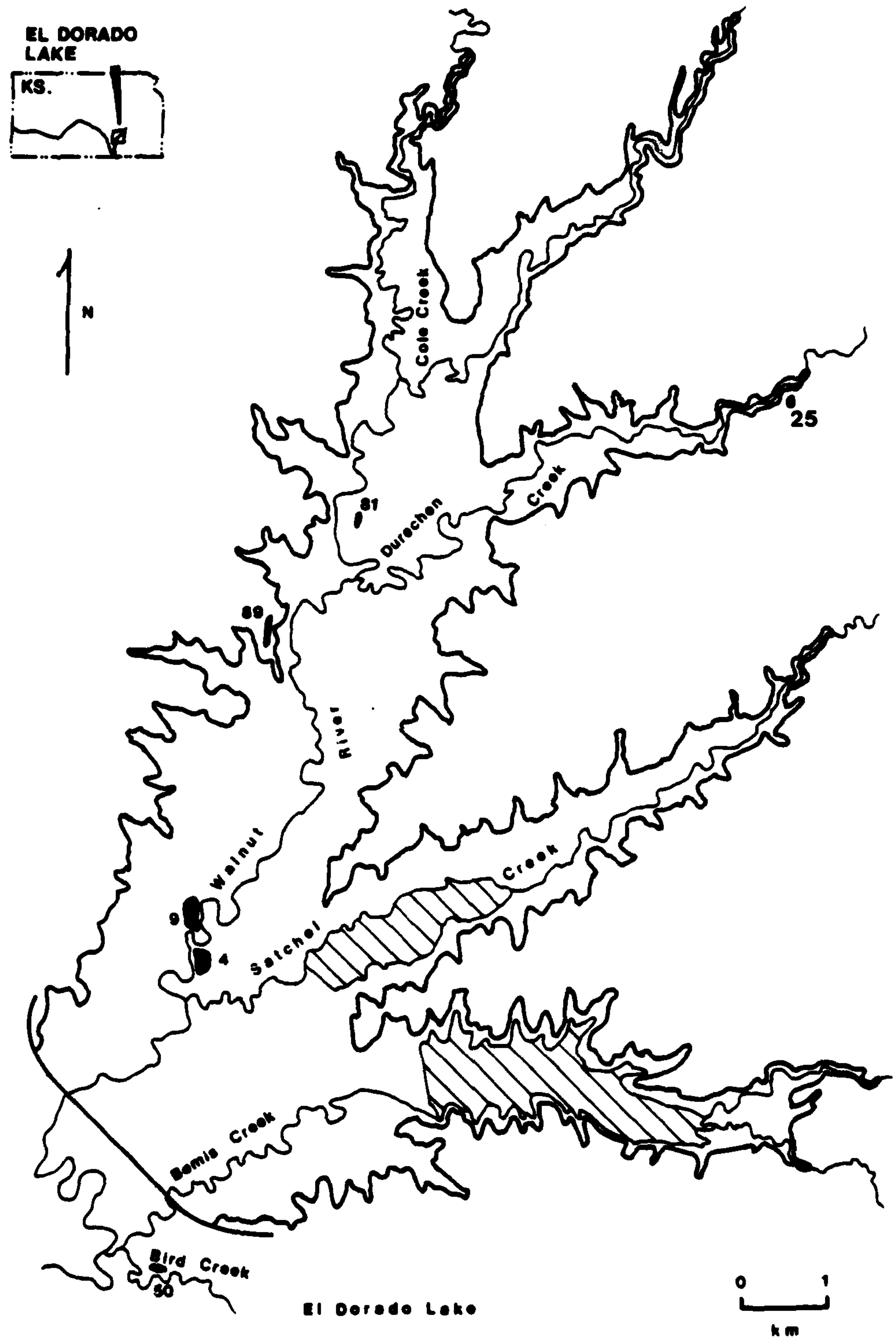

Figure 3.1. Location of 14BU25 and other Late Archaic sites within the El Dorado Lake area. (The 14BU-prefix is omitted from site numbers.)

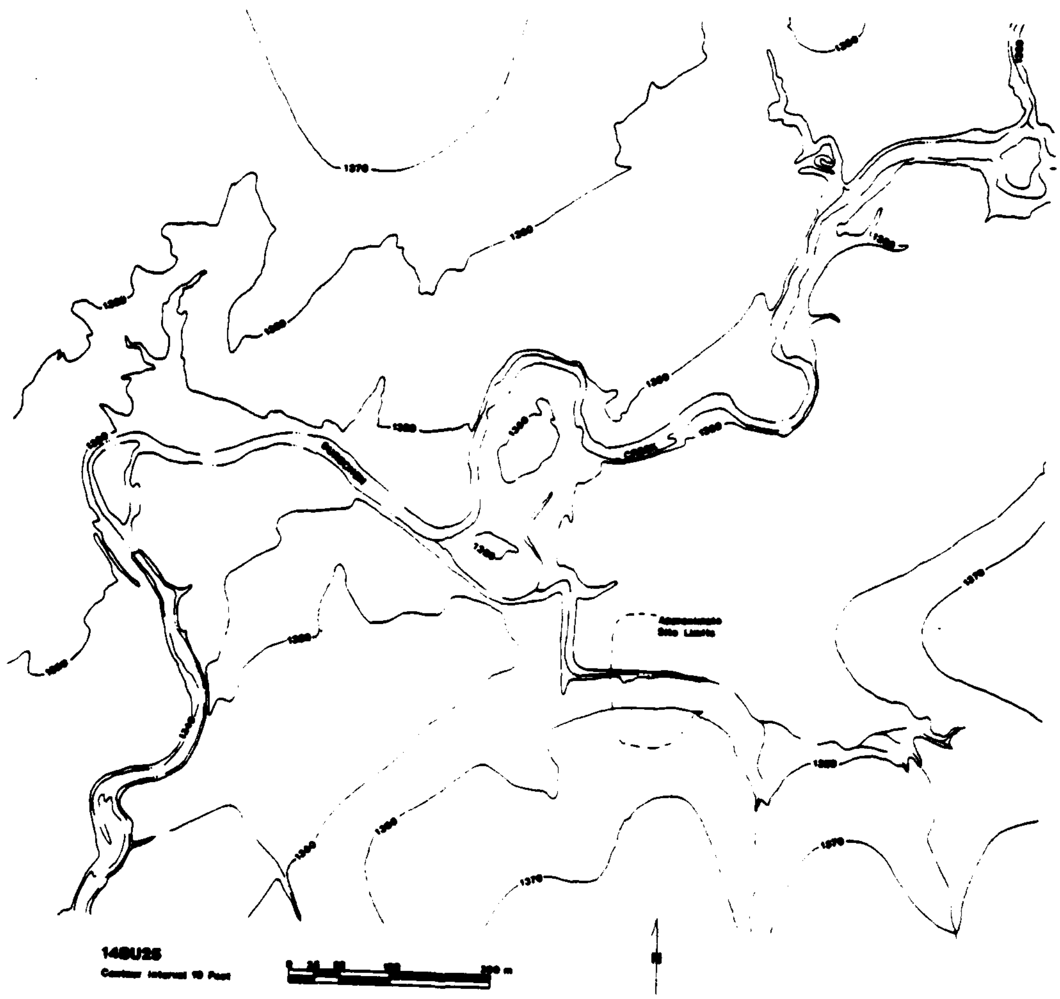

Figure 3.2. Contour map of the Durechen Creek valley in the area of 14BU25.

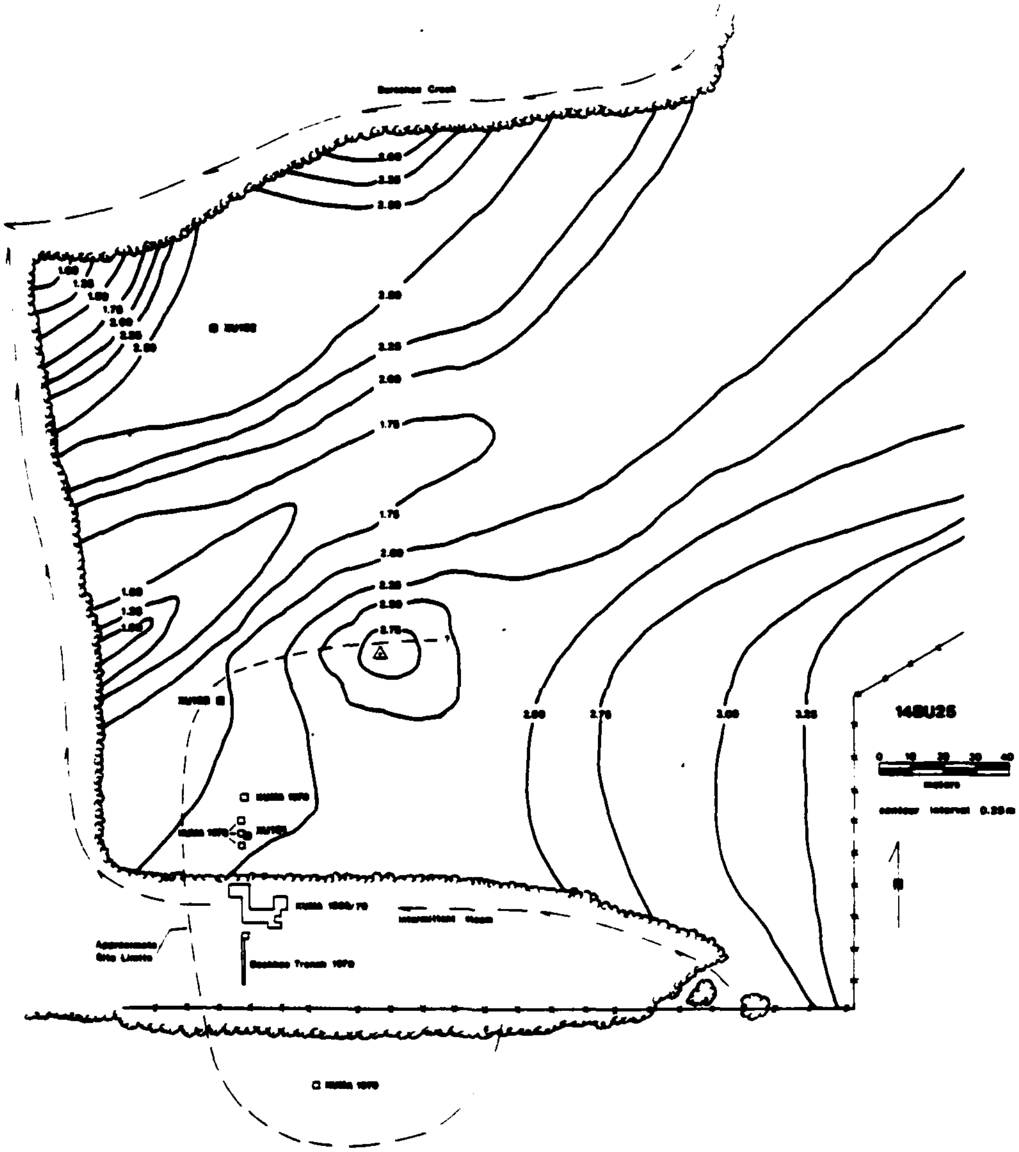

Figure 3.3. Contour map of 14BU25 showing the location of excavations and approximate site limits.

artifact sample was retrieved from the gully banks (Eoff and Johnson 1968:36). In 1968 preliminary tests were carried out and in 1969 and 1970 a block excavation was dug. In 1973 small scale testing was again conducted; excavations were within the 1967-70 block and in the field to the north.

None of these excavations have been reported. Extant field records were insufficient to ascertain the relationship between stratigraphic units and the cultural deposit; the nature of the stratigraphy itself, i.e., whether the strata represent soil horizons or sediment units; and the placement of bank cuts and excavations in relation to the natural topography; and in the case of 1973 work, the relation of some units to each other. Insufficiencies in some data sets, especially those pertaining to natural stratigraphy, are a result of recent increases in knowledge of the geomorphic history of the El Dorado area and to the changing perspectives in archeology during the ten years since the major excavations were conducted. Lack of certain kinds of information should not obscure the overall quality of the 1969-70 fieldwork. No contour map of the site had ever been prepared and no permanent monuments had been placed.

With the above problems in mind, small scale test operations were once again conducted in 1979. Field objectives were to: (1) make a topographic map of the site vicinity, (2) locate previous excavations, (3) determine the nature of the stratigraphic units, (4) determine any relationships between natural and cultural stratigraphy, and (5) determine site limits within federal property boundaries as accurately as possible given constraints imposed by a buried deposit.

Toward these ends, a contour map was prepared of the cultivated field in which part of the site is located. A transit and metric leveling rod were used. The site reference point was established on a high spot and a metric grid system was imposed on the site; the reference point was arbitrarily designated 500N500W (Fig. 3.3). (Laboratory calculations show that 1979 reference point is at coordinates 574N437W in the original 1969-70 grid system.) Many topographic features of the modern land surface may bear little relation to the cultural deposit. However, artifacts were surface collected from low areas in the field. The relationship of surface finds to topographic features is somewhat enigmatic, as will be discussed below. The linear depression that runs through the central portion of the field is probably a paleochannel of Durechen Creek. The feature continues westward, eventually intersecting the modern creek channel 500 m. southwest of the site (Fig. 3.2). Previous excavations in the vicinity of the gully have never been backfilled and were easy to locate; limits were shot in with a transit and metric leveling rod (Fig. 3.3).

As mentioned above cultural material was recovered from low spots in the cultivated field. No surface artifacts were observed in high areas. Artifacts were retrieved from the northwest corner of the field, near the north monument hub, and the western part of the paleochannel (Fig. 3.3). 14BU25 has been previously reported to contain deeply buried cultural material exposed only in the gully (Eoff and Johnson 1968:36), making surface finds in the field somewhat unexpected. Presence of surface

material may be explained in several ways: (1) the buried deposit is being exposed, (2) a previously unrecorded surface component is present, or (3) artifacts from sites upstream were washed in by violent flooding during 1979. These alternatives will be examined below when excavations are discussed.

Three 2 by 2 m. excavation units were set up in order to determine how far toward Durechen Creek, and onto federal land, the site extends and the nature of the stratigraphic relationships discussed above. Units were located at 442N540W, 600N550W, and 484N548W (1979 system); coordinates designate the southeast corner of squares. Excavation units are referred to as XU101, XU102, and XU103, respectively.

Excavation was accomplished with hand tools (shovels and trowels). Culturally sterile overburden was shoveled out until depths were reached which, based on previous excavations, would be just above the cultural deposit. At these points, excavation proceeded by shovel scraping in arbitrary 10 cm. levels. When cultural material was encountered, site matrix was screened through ¼-inch mesh sifters. All walls and floors were troweled and inspected for feature stains and stratigraphic changes. Retouched tools and identifiable bone were three-dimensionally plotted. Horizontal coordinates were measured north and west from the southeast corner reference hub, vertical coordinates were also measured from that point with the aid of a line level (in cm. below ground surface).

XU101 was established near the federal property line between the 1969-70 block excavation and 1970 test pit (Fig. 3.3). Cultural material had been recovered from the 1970 test unit and, therefore, the deposit was inferred to be present in the area of XU101. The unit was established to determine stratigraphic relationships and the physical nature of the cultural deposit in the vicinity of the 1969-70 block.

Excavation proceeded by shoveling out the first 70 cm. as a single unit. To test for the presence of a surface component, approximately 100 liters of dirt from near the surface was screened through a ¼-inch mesh sifter. No artifacts were recovered and the procedure was discontinued. At 70 cm. below surface a soil change had occurred and field technique was changed to shovel scraping, using 10 cm. levels for vertical control. The first artifact was recovered from level 6 (110-120 cm. B.S.); after this level, backdirt was screened. A 17.5 l. soil sample was taken from levels 6 through 17. The number of artifacts recovered per level increased through level 11 (160-170 cm. B.S.), where 648 artifacts were retrieved; after this level artifact density steadily decreased. Only one small bone fragment was recovered from level 17 (220-230 cm. B.S.) and excavation was discontinued. As shown in Table 1, artifacts recovered consist primarily of chipped stone. The two pieces of limestone recovered from level 2 are small, rounded pebbles; given the vertical distance to the first unambiguous cultural objects, these are probably natural.

Unexpectedly and unfortunately, an old excavation was hit along the west wall of XU101. The old unit sloped gradually inward so that at 120 cm. below surface, 14.2% of the 1979 excavation was disturbed; but at 190 cm. below surface, where the old unit stopped, only 1.0% was disturbed.

At the time field work was in progress, no excavations were known to have been placed in this area. Test units dug in 1973 were thought to have been over 100 m. to the northeast and all 1968, 1969, and 1970 excavations had been located. After field work ended, it was discovered that two coordinate systems were used in 1973, one for work within the block opened originally in 1969-70 and another for the three 2 by 2 m. units in the field. Three separate systems were also employed to record three dimensional artifact plots. XU101 hit the middle of three 1973 test pits placed north of the block, as indicated by the second grid system of that year (Fig. 3.3).

The south wall profile revealed five stratigraphic units (Fig. 3.4). The uppermost is a black laminated silt deposit averaging 3 cm. in thickness that was laid down by the flood of June 1979. Extending from 3 to 65 cm. below surface is a black (10YR 2.5/1 - moist) clay loam unit with a blocky ped structure; this is the A horizon of the modern soil. A dark brown (10YR 3/3 - moist) silty clay Bt soil horizon extends from 65 to 90 cm. below surface; ped structure is blocky. From 90 to 158 cm. is a very dark grayish brown (10YR 3/2 - moist) silty clay loam with a blocky ped structure. This unit is a paleosol; it is probably the A horizon of this buried soil. There is a gradual transition from 145 to 158 cm. where the soil turns dark grayish brown (10YR 4/2 - moist); it is still a silty clay loam, but begins to lose structure. The last stratum extends from 158 cm. to an unknown depth. At the top of the unit material is a dark grayish brown (10YR 4/2 - moist) silty clay loam, but it changes at about 220 cm. to a grayish brown (10YR 5/2 - moist) clay loam. The transition is extremely gradual, no unit boundaries could be detected, and therefore, no separate unit is designated. Towards the bottom of the excavation, pockets of gravel and small manganese particles become frequent. The bottom stratum is parent alluvium (C horizon); there is a small transition between the buried soil and parent material. No plowzone was present at the time of investigations; it was washed away by the flood. Transitions between all soil horizons are gradual.

Previous investigators have speculated that several distinct occupations are represented at 14BU25; one base camp and two or three temporary camps (see Leaf 1979a:9). Depth distribution data from XU101 (Table 3.1) do not support speculations of this kind. Artifact density is very low in levels 6 through 9 (110 to 150 cm.), rapidly increases in levels 10 through 12 (150 to 180 cm.), then falls off sharply in levels 13 through 17 (180 to 230 cm.). Number of bone specimens is not as representative of artifact density as are other artifact classes because bone was fragile and tended to break up into smaller pieces in the screen. Weight is a better indicator of amount of bone recovered. Bone generally increases in quantity with depth, not following the pattern of chert distribution. One reason for this difference may be differential preservation, another may be that all the bone is not of cultural origin. Although cultural specimens were distributed over 110 cm. (110 to 220 cm.), 79.5% (1243 of 1565) of them were recovered from the 30 cm. span from 150 to 180 cm. below surface. Given these observations, it seems more reasonable to postulate a single series of related occupations with the resultant cultural deposit being extensively pedoturbated. Numerous pedoturbation processes have been outlined by Wood and Johnson (1978), many of which

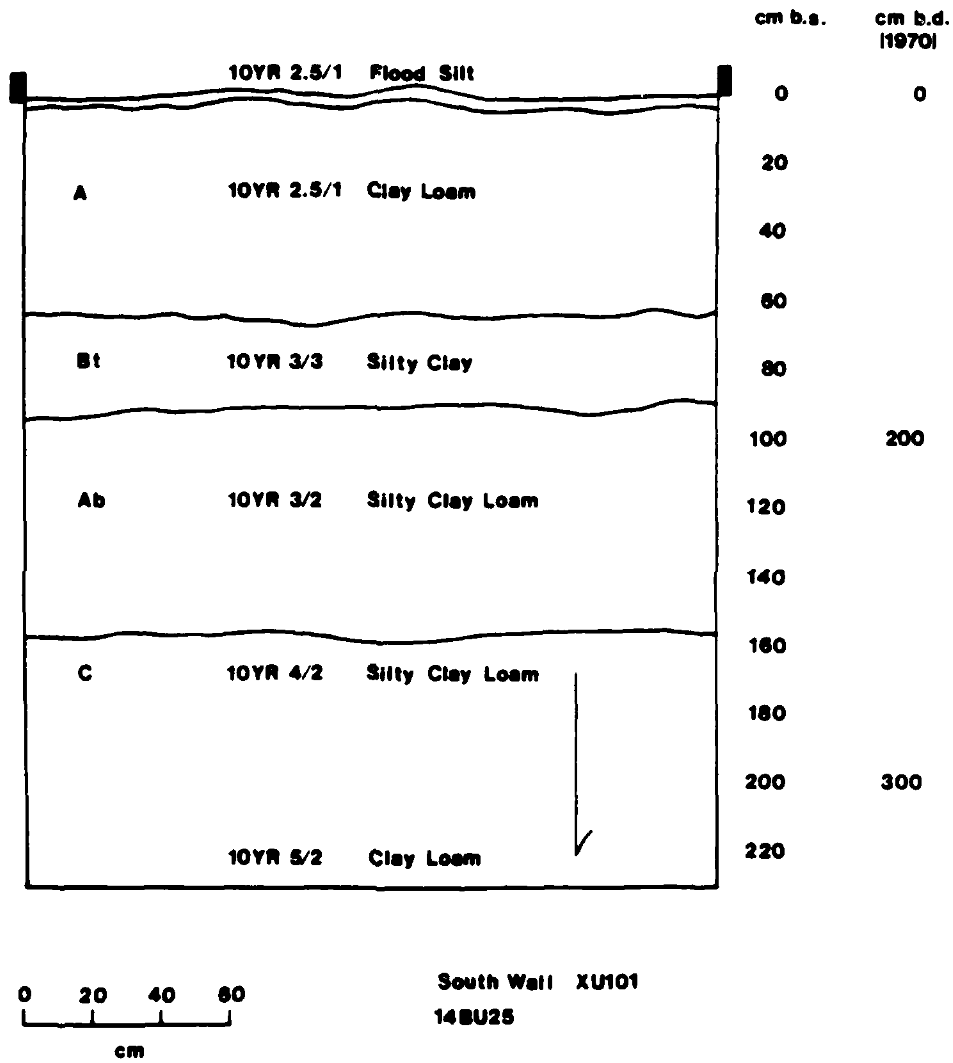

Figure 3.4 South wall profile from XU101 (14BU25, 1979).

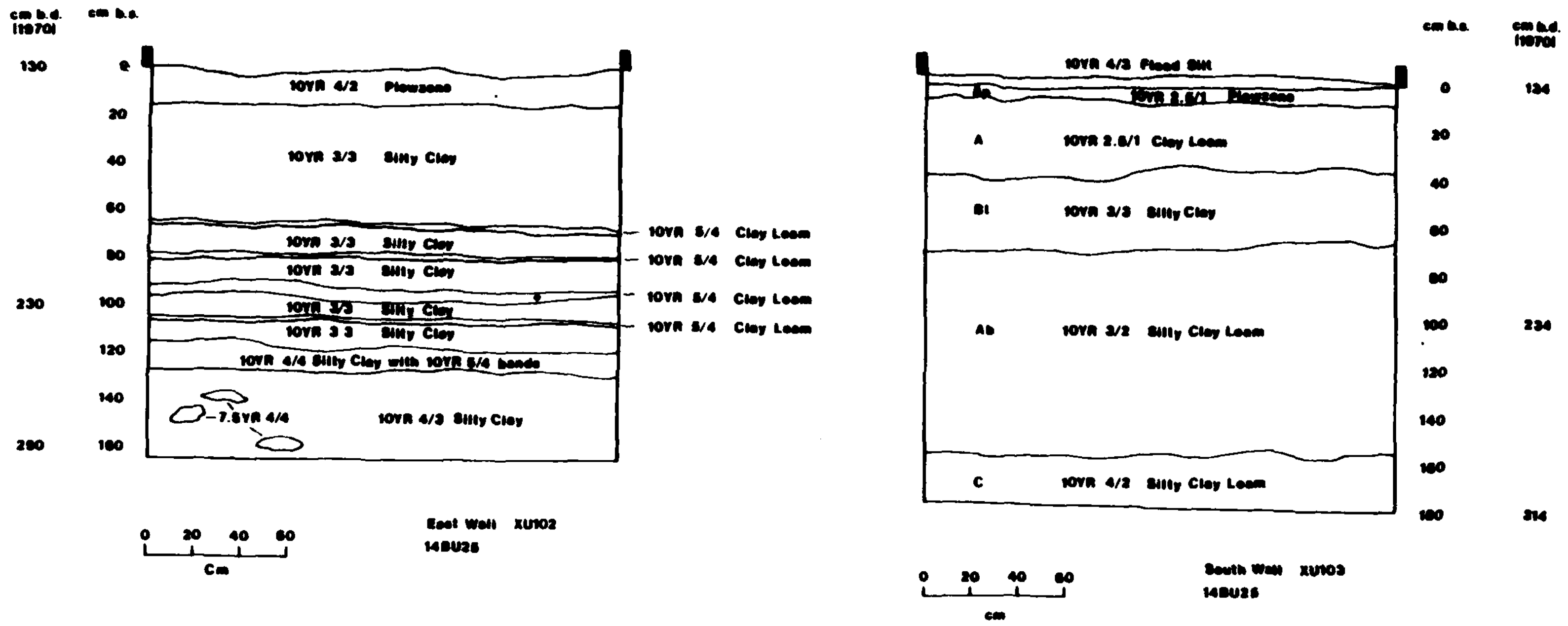

Figure 3.5. East wall profile from XU102 and south wall profile from XU103 (14BU25, 1979).

Table 3.1. Depth distribution of artifacts from XU101 (14BU25).

Level (cm. B.S.)	Chipped Stone	Bone	Limestone	Chert Gravel	Burned Earth
1 (0-70 cm.)	-	-	-	-	-
2 (70-80 cm.)	-	-	2	-	-
3 (80-90 cm.)	-	-	-	-	-
4 (90-100 cm.)	-	-	-	-	-
5 (100-110 cm.)	-	-	-	-	-
6 (110-120 cm.)	2	-	-	-	-
7 (120-130 cm.)	2	-	-	-	-
8 (130-140 cm.)	2	-	-	-	-
9 (140-150 cm.)	21	-	-	-	-
10 (150-160 cm.)	112	-	-	-	-
11 (160-170 cm.)	633	10/0/5 gm.	-	5	-
12 (170-180 cm.)	440	37/2.2 gm.	3	2	-
13 (180-190 cm.)	69	12/1.0 gm.	-	2	1
14 (190-200 cm.)	70	54/2.0 gm.	-	1	-
15 (200-210 cm.)	24	19/9.2 gm.	-	1	1
16 (210-220 cm.)	6	34/12.5 gm.	-	-	-
17 (220-230 cm.)	-	1/0.1 gm.	-	-	-

may have contributed to vertical artifact movement on 14BU25. Direct evidence of floral-turbation (plant disturbance) was observed in the form of tree root stains extending through the cultural midden. The 1979 flood dramatically demonstrated the extent to which overbank flooding can disturb a cultural deposit. Soil was washed away in some places and deposited in others. Extent of violent flooding in the past is not known, but the possibility for extensive disturbance is obviously present.

XU102 was placed on a high spot in the northwest corner of the field (Fig. 3.3). The unit was established to test for intact cultural midden near Durechen Creek. As noted above, artifacts were surface collected from low spots to the northwest and northeast of XU102. To test for a surface component, the first 5 cm. of matrix was screened through a ¼-inch mesh sifter; no cultural material was recovered. The first level was excavated to 15 cm. below surface, at which point a soil change occurred from dark clay loam to a redder, hard packed clay. The latter stratigraphic unit had not been encountered in XU101, and therefore, subsequent excavation proceeded in 10 cm. levels due to unknown subsurface conditions. The test square was dug to a depth of 165 cm.; no cultural material was found. An auger test was placed in the center of the square and continued to 265 cm. below surface; no artifacts were encountered.

The stratigraphic profile was completely different from that of XU101. There are 12 zones; nine of these are alternating dark clay units and lighter colored sediment bands. The uppermost unit is plowzone, which is a dark grayish brown (10YR 4/2 - dry) clay loam, 15 cm. thick. Underlying this is a hard packed, dark brown silty clay (10YR 3/3 - dry) which extends to about 65 cm. below surface. Alternating sandy, yellowish brown (10YR 5/4 - dry) sediment bands and dark brown silty clay units go from 65 to 117 cm. From this point to 126 cm. is a dark yellowish brown silty clay (10YR 4/4 - dry) with several closely spaced yellowish brown sediment bands. Extending from 126 cm. to an unknown depth is a dark brown (10YR 4/3 - dry), soft, silty clay mottled with large dark brown (7.5 YR 4/4 - dry) patches (Fig. 3.5).

Excavation of XU102 demonstrates that no surface or buried cultural deposits are present near Durechen Creek; this situation is presumed to exist for the area between the creek and the posited paleochannel. Surface material near XU102 may represent artifacts washed in from 14BU61, located just upstream, or alternatively, they may represent a very thin surficial deposit which was washed into and concentrated in low areas by the flood. A complex depositional history is indicated by the XU102 profile. Alternating bands of silty clay and clay loam may indicate periods of overbank flooding of alternating low and high energy depositional environments. However, since no cultural material was recovered from the unit, tests were not made to determine the exact nature of that history.

Excavation of XU101 and one of the 1970 test units demonstrated that cultural material went at least 30 m. north of the gully. Another unit, XU103, was placed at the edge of the paleochannel to determine if the site went that far north. The first 1.0 m. of overburden was removed as a single unit. Subsequent excavation continued in 10 cm. levels; beginning at 140 cm. below surface, backdirt was screened. Only a few small chert

lakes were recovered from the entire unit (Table 3.2). No cultural aterial was encountered in level 9 (170-180 cm.) and since most material n XU101 was recovered from 150 to 180 cm., excavation was discontinued. tratigraphy was basically the same in XU103 as in XU101 except for varyng thicknesses of soil horizons and the presence of some plowzone which as not washed away by the flood (Fig. 3.5).

able 3.2. Depth distribution of artifacts from XU103 (14BU25)

Level (cm. B.S.)	Chipped Stone
1 (0-100 cm.)	-
2 (100-110 cm.)	-
3 (110-120 cm.)	1
4 (120-130 cm.)	-
5 (130-140 cm.)	-
6 (140-150 cm.)	2
7 (150-160 cm.)	2
8 (160-170 cm.)	3
9 (170-180 cm.)	-

Test excavations conducted in 1979 demonstrate that the site goes pproximately to the south edge of the paleochannel; no intact deposit is resent north of that area. The cultural horizon is in the lower 10 cm., nd 20 cm. below a buried soil; only one component is represented. The eposit has been extensively disturbed by pedoturbation, accounting for ultural material being scattered through the ground vertically for more han one meter.

In 1968, six profiles were dug into the gully sides where artifacts ere eroding out. Vertical provenience was recorded only as light or ark zone, referring to the bottom two strata illustrated in Figure 3.4. n 1969 and 1970, a 110 m^2 area was opened up in and along the gully, a by 2 m. test unit was placed in the field to the north, and a similar nit was excavated in the uplands to the south (Fig. 3.3). Provenience nits in the block excavation were dug to various levels; many did not each the bottom of the cultural deposit. Several units were excavated n the bottom of the gully where little intact deposit remains. At least 0 m^2 of intact cultural deposit was excavated. Although exact field echniques were not recorded, most artifacts are three dimensionally lotted to the nearest cm. Provenience control of some units was by 2 m. quare and 15 cm. level. Over 10,000 three dimensionally plotted artiacts were recorded, made up primarily of chert, limestone, and bone. xcavation seems to have been done alternately by shovel scraping and roweling, depending on artifact density. No mention of screening site

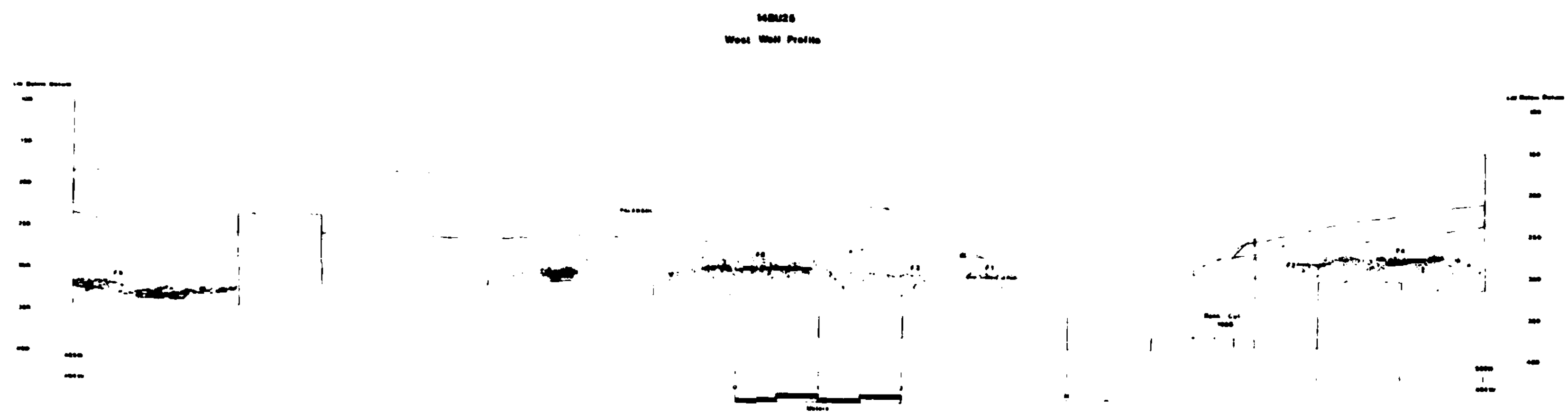

Figure 3.6. West wall profile of 1969/70 block excavation showing the location of three dimensionally plotted complete flakes, chunks and shatter, cores and core fragments, all flake tools, all retouched tools, and features, and the spatial relationship of the cultural horizon to the paleosol.

matrix was made. Soil samples were taken from various provenience units, but the method of processing them was not recorded. Profiles are essentially the same as the ones recorded in XU101 and XU103. Minor fluctuations in stratum thicknesses were noted and the zone beneath the paleosol was divided into two zones (called zones D and E in field notes). A gradual color change was noted in parent material in XU101 with increasing depth, but no division indicating separate units could be observed. On the south side of the gully a "yellow mottled clay" unit was recorded beginning at 230 cm. below surface; this stratum also occurs in provenience units located in the gully which were excavated below the level of cultural material. A "yellow sand" stratum was recorded beneath the "yellow mottled clay" in the gully.

Vertical plots of chipped stone artifacts indicate that debris density increases with depth, reaches a maximum, and then gradually declines; most artifacts are located within a 30 cm. vertical range situated below soil development (Fig. 3.6). No evidence for more than one component is present. As is the case for XU101, the cultural deposit is extremely pedoturbated. Observed disturbance factors include large tree roots which extend through the cultural horizon and gully downcutting in an area of high artifact density.

One test pit was placed 26 m. north of the block (10 m. north of XU101). Overburden was removed from a 2 by 2 m. area, but at 1.0 m. below surface the unit was reduced to a 1 by 2 m. area. One biface fragment and 56 flakes were recovered from this test. Eleven flakes do not have recorded vertical provenience; the remaining artifacts were all recovered from 170 to 200 cm. below surface, which is just beneath the paleosol. Another test unit was situated in the uplands, about 50 m. south of main excavations (Fig. 3.3). This 2 by 2 m. square was dug to 1.0 m. below surface; soft bedrock was encountered at 80 cm. A few flakes and a biface fragment were recovered from depths ranging from 0 to 45 cm.

Work during 1969-70 left several provenience units (2 m. squares) with large amounts of cultural deposit unexcavated. In 1973, 20 m^2 were excavated within the earlier block and three test pits were opened up to the north. Procedures are not stated in field notes, but provenience control was by 2 m. square and 10 cm. level. Tools and identifiable bone were three dimensionally plotted to the nearest cm. No profiles were recorded; it is assumed that natural stratigraphy is comparable to the other excavations. Vertical structure of the cultural deposit is the same as that described for the rest of the site. Test units were dug to depths where cultural material occurred in relatively low frequency.

A number of broken artifacts from the block excavation (1969, 1970, and 1973) were cross mended during the course of laboratory work. Vertical separation of up to 26 cm. of fragments of the same artifact are recorded. A complete list of cross mended artifacts is given in Table 3. These figures lend strong support to the hypothesis that the deposit is heavily pedoturbated.

The cultural deposit on the Milbourn site consists of an area of relatively high artifact density about 30 cm. thick referred to as the

Table 3.3. Cross mended artifacts from 14BU25.

Cat. No.	Artifact	M. North	M. West	cm. Below Datum
A14303	Flake	485.93	495.68	319
A14299		485.34	495.72	317
Vertical Separation				2 cm.
A44142-16	Chunk	490.	492.	295-305
A44165-1		490.	490.	285-295
Vertical Separation				min. 10 cm., max. 20 cm.
A44027-5	Biface	492.30	491.90	305
A37316		491.05	489.23	303
Vertical Separation				2 cm.
A44111	Biface	492.34	490.87	321
A44047-1		492.	488.	295-305
Vertical Separation				min. 16 cm., max. 26 cm.
A4898	Biface	492.93	494.33	289
A4861		494.34	495.11	282
Vertical Separation				7 cm.
A44067	Biface	491.70	492.10	280
A35958		492.96	490.96	306
A35961		493.63	491.92	306
Vertical Separation				26 cm.
A44089	Biface	492.01	492.12	290
A44090		492.47	492.87	292
Vertical Separation				2 cm.
A4989	Pronghorn	499.80	495.99	322
A4822	Calcaneus	499.76	496.20	300
Vertical Separation				22 cm.
A14297	Deer M_1	494.23	495.30	308
A14412	Deer M_2	494.24	495.38	314
A14413	Deer M_3	494.23	495.35	313
Vertical Separation				6 cm.

Note: small portions of the mandible are also present.

"occupation zone" and 30 to 40 cm. of thin scatter above and below this zone. The occupation zone has been diffused vertically by disturbance processes. Several formation processes may be adduced as possible explanations for the physical make-up of the cultural deposit. These are:
(1) multiple short term occupations (e.g., several weeks or a month);
(2) multiple seasonal occupations (e.g., one or more seasons); or
(3) year round occupation. The quantity of debris is evidence against a single short term occupation being represented.

Due to extensive disturbance, no microstratigraphy was observed which would serve to distinguish multiple occupations, if present. However, the location of the site, along the south valley wall of a small tributary, would offer little natural protection from severe weather. No evidence for the presence of structures was found. Therefore, year round occupation is unlikely. The occupations were probably short term or seasonal. Occupation at 14BU25 was probably not for prolonged periods (several seasons) or by large aggregates of people. Evidence supporting this statement is admittedly circumstantial. Namely, no organic staining of the occupation zone is present as is the case with sites that represent prolonged aggregations of large groups, such as Nebo Hill (Reid 1980) and the Helton phase deposit at Koster (Cook 1976). Of course, organic staining might have been leached away.

In summary, investigations during 1969, 1970, 1973, and 1979 have led to excavation of a block that extends to both sides of the gully, seven 2 by 2 m. test units in the field to the north and a 2 m. square in the uplands to the south. An extensive, buried cultural deposit is present. Artifacts have been recovered from over one meter in vertical extent, although most are concentrated in a 30 cm. thick zone. Indications are that the deposit has been extensively pedoturbated. Buried material occurs in a north-south direction from near the edge of the uplands to the south side of a paleochannel of Durechen Creek. The site runs at least 100 m. east-west, but the eastern boundary has probably not yet been exposed by gully downcutting. A thin scatter of debitage and a few broken tools occur in the uplands. Areal extent of the site is at least 1.4 ha. A series of short term occupations are hypothesized to be represented.

Chipped Stone

Introduction

Lithic tool production is a reductive technology in which certain activities must be carried out in a linear sequence, which may be divided into a series of steps for analytical purposes (e.g., Holmes 1919; Sharrock 1966; Skinner 1971; Collins 1974, 1975; Callahan 1974; Sheets 1975; Katz 1976; Patterson 1977). The linear relationship of manufacturing processes stems from the dependence of all steps, but the initial one, on output from previous steps. In other words, raw material must be procured before manufacturing can begin, flakes must be struck for use as blanks or to prepare platforms before shaping of a tool can begin, and so on through the sequence. Chipped stone tool manufacture is, in part, a set of noncommutative enactments, i.e., the behaviors which

make up tool production are related in such a way that variation in the order of their occurrence will affect the end product (Krause and Thorne 1971:256). Therefore, tool production can be modeled as a set of behaviors arranged in a linear sequence according to the processes of raw material acquisition, manufacture, use, recycling, and maintenance, as outlined by Schiffer (1972).

Based on Schiffer's general model, a model relating specifically to chipped stone tool manufacture has been set forth by Collins (1974, 1975) which consists of five steps: (1) acquisition of raw material, (2) core preparation and initial reduction, (3) optional primary trimming, (4) optional secondary trimming and shaping, and (5) optional maintenance and/or modification. Not all of these steps are necessary for production of all tool forms. With the addition of "use," which may come at any time after the stone has been chipped, the model is analogous to Schiffer's general model for durable cultural elements. There are several examples of lithic analyses which employ models based on these concepts (e.g., Collins 1974; Sheets 1975; Katz 1976; Gould 1977).

The chipped stone assemblage from 14BU25 is divided into several technological classes; each class is analyzed in the following sections. Technological classes are: (1) flakes, (2) bifaces, (3) marginally retouched cobbles, (4) marginally retouched flakes, (5) selected raw materials, (6) cores and core fragments, and (7) chunks and shatter. These classes represent the products and by-products of chipped stone tool production; each may result during one or several steps in the reduction continuum. A discussion of raw materials utilized for chipped stone tool production precedes the artifact analyses.

Raw Materials

Eight identified kinds of raw materials are present in the chipped stone assemblage: (1) Florence A, (2) Florence B, (3) Flint Hills light gray, (4) Flint Hills green, (5) Wreford, (6) Cresswell, (7) Foraker cherts, and (8) quartzite. Other chert varieties are present but these are either miscellaneous or indeterminate. Miscellaneous cherts are those that are not one of the identified types, but are of unknown origin; indeterminate specimens lack the attributes necessary for any kind of identification, usually because of small size or weathering (Haury 1979a, 1979b).

The total weight for each raw material type for all complete flakes, complete tools, and cores and core fragments is presented in Table 3.4. Foraker chert is represented by a single flake fragment which weighs 28.0 gm. Quartzite is represented by one tool fragment which weighs 21.9 gm. The large amount of Florence B and large average specimen sizes for Florence G and Flint Hills light gray cherts reflects their selection for the manufacture of large tools and selection of large river cobbles for use as cores to produce flakes which were marginally retouched or utilized without modification.

Table 3.4. Total weights of raw material types for complete tools and flakes, and cores and core fragments.

Raw Material	Total Weight	n	$\bar{X}$
Florence A	2858.5 gm.	529	5.40 gm.
Florence B	8989.6 gm.	966	9.31 gm.
Flint Hills light gray	1955.1 gm.	71	27.54 gm.
Flint Hills green	81.2 gm.	8	10.15 gm.
Wreford	33.5 gm.	7	4.79 gm.
Miscellaneous	38.8 gm.	7	5.54 gm.
Cresswell	79.2 gm.	10	7.92 gm.
Indeterminate	104.6 gm.	116	1.61 gm.

Only one piece of unmodified raw material and one slightly modified piece were recovered from excavations. A selected raw material is a piece of chippable stone that is large enough to have been manufactured into a chipped stone artifact, but that could not have been present on the site via natural processes. Raw materials with one fresh flake scar are called "tested raw materials"; those with no modifications are referred to as "unmodified raw materials."

Several large (up to 10 cm. in maximum dimension) chert stream cobbles were found on the site. Such cobbles are known to occur naturally in the local alluvial deposits, and thus do not necessarily represent human selection. Only two pieces of selected raw materials were recovered. Both are Florence B chert; one is a stream cobble, the other a tabloid from a bedrock deposit. A flake has been detached from the stream cobble and as such is classified as a tested raw material. The tabloid is unmodified, but could not have occurred on the site naturally and thus represents a piece of chert transported to the site by humans. The cobble and tabloid weigh 252.8 gm. and 198.6 gm., respectively. The virtual absence of raw materials on the site suggests that they were processed elsewhere and/or that pieces brought to the site were systematically modified into other forms.

Flakes

Flakes are divided into three preservation states according to the kinds and extent of observations which can be made on each specimen. Complete flakes are pieces of chipped stone with the following attributes: (1) a striking platform or determinate remnant, (2) a ventral surface (most specimens have a bulb of force and/or compression rings), (3) a dorsal surface exhibiting negative flake scars and/or cortex and/or patina, and (4) two lateral edges and a distal edge. Proximal flake fragments have the same characteristics as complete flakes, except that at least one

lateral edge is missing. "Other" flake fragments have no intact striking platform or platform remnant (cf. Leaf 1979b:101). As defined, the flake sample includes several blades (Crabtree 1972:42) and tabular flakes (White 1963:13-14). However, blades may be occasionally produced in any assemblage and, therefore, their presence in small numbers (n=3) in the 14BU25 sample does not necessarily indicate a technique of systematic blade production (cf. White 1963:8). Almost 15,000 flakes were recovered from the excavations of 1969, 1970, 1973, and 1979. Because of the large number of specimens, only a sample are analyzed. All complete flakes from 1969, 1970, and 1979 field work and those from 1973 excavations inside the 1969-70 block that are larger than 7.0 mm. in their greatest linear dimension, and all utilized pieces (broken and unbroken) are selected for use in this study. This comprises 1682 specimens: 1601 complete, 31 of which are utilized, and 81 broken, utilized flakes. Pieces smaller than 7.0 mm. are not included in the analysis because many measurements are difficult to make accurately and most nominal scaled observations are indeterminate. Biases introduced by these sample selection techniques are discussed below.

A series of ratio and nominal scaled measurements are taken on the flake sample which allow inferences concerning raw material selection, manufacture, use, and maintenance activities. Ratio scaled variables include length, width, thickness, weight, and flake angle. Length is the maximum distance measured perpendicular to the plane of the striking platform and the flake distal edge. Width is the maximum distance between the two lateral edges, measured perpendicular to length. Thickness is the maximum distance between the dorsal and ventral flake surfaces, measured perpendicular to the dorsal surface. Length, width and thickness are measured to the nearest 0.1 mm. with sliding calipers. Weight is measured to the nearest 0.1 gm. with a Harvard trip balance. Flake angle is the angle formed between the plane of the striking platform and a line drawn between the intersection of the ventral surface and the striking platform and the flake distal end. The angle is measured between the striking platform plane and the ventral surface (similar to the angle beta of Wilmsen (1970, fig. 5)). Measurements are taken with the aid of a contour gauge and goniometer and are recorded to the nearest degree. However, replications indicate this measure is only accurate to $\pm 3^{\circ}$.

Nominal scaled measurements include chert type, thermal alteration, presence or absence of cortex or patina, type of cortex or patina, striking platform state and utilization. Several types of Flint Hills cherts were noted in the sample; these are discussed below under "Raw Material Procurement." Thermal alteration is recorded as a three state variable, i.e., present, absent, or indeterminate. It is recorded as "present" if a specimen exhibits at least one of the following characteristics: (1) a color change relative to that of known, unaltered specimens (usually to shades of pink or red, but sometimes to dark gray), (2) macroscopically visible luster on flake surfaces, (3) potlid fracturing, and (4) crazing. Using these criteria, only those cherts which exhibit macroscopically visible changes upon heating are correctly identified as thermally altered. Cortex or patina is recorded as primary (covering the entire dorsal surface), secondary (covering more than 10%, but not all of the dorsal surface), or absent (covering less than 10% of the dorsal surface).

Type of cortex or patina reflects whether the specimen was derived from a bedrock or residual deposit, from river beds or alluvial terraces, or from indeterminate sources. These distinctions are explained under "Raw Material Procurement." Observed striking platform states are cortical, patinated, plain, faceted, dorsally reduced, and collapsed. Dorsal reduction and grinding occur in conjunction with other platform states. Determination of platform state is accomplished with 10x magnification using a Bausch and Lomb stereozoom binocular microscope. Utilization is recorded as present, absent, or indeterminate. Determinations are made by inspecting flake edges under low (10-40x) magnification for degradative wear. Evidence for utilization is discussed more fully below under "Use."

Raw Material Procurement

The predominant chert type represented among completed flakes is Florence B, making up 60.9% of all determinate specimens. Assuming no differential breakage among chert types, Florence B was knapped at the site more often than all other cherts combined. Florence A represents 33.2% and Flint Hills light gray 4.2% of determinate specimens; other cherts occur rarely. One flake fragment is made of Foraker chert; this type is not represented in the complete flake assemblage. Counts and percentages of chert types for complete flakes are presented in Table 5.

Possibly chert from all four physiographic features was being knapped at the site (Haury 1979b). Stream and terrace gravels and nodules are patinated, varying from light to dark brown to red. Occasionally, dense, well-rounded and smoothed, white cortex is present in conjunction with patina. Bedrock and residual cherts are covered with white to light brown, rough, irregular, porous cortex. Patina may develop on these cherts on exposed faces or weathering cracks, but is distinguishable from that on waterworn cherts by its rough appearance. Source is determinate on 200 flakes; 138 came from bedrock and/or residual deposits and 62 are from stream and/or terrace sources. Several specimens had cortex covered with potlid fractures, while the chert exhibited no signs of heat treatment. These features are diagnostic of frost pitting, which occurs only on residual specimens. No high gravel terrace deposits are near 14BU25, and therefore, the majority of patinated specimens are probably derived from river cobbles.

Even though Durechen Creek provides a source of stream cobbles a few meters from the site, bedrock and/or residual deposits were exploited more frequently. Forty-one of 67 (61%) Florence B and 73 of 82 (89%) Florence A determinate decortication flakes are from bedrock/residual sources. These figures may even underestimate selection for these cherts in light of the fact that nodule trimming of chert from sources father away (bedrock/residual) would probably take place more often at quarry locations than at the site. It appears that lower quality chert that occurs practically on the site was bypassed for more distant, but superior grade raw materials. Similar situations exist in northeastern Oklahoma, Woodland and Plains Village sites where Florence A chert was used most extensively even though it outcrops farther away than other chert variaties used at the sites (Henry 1978:94-5). The procurement pattern of Flint Hills light

Table 3.5. Counts and percentages of chert types represented among complete flakes.

Chert Type	Core Preparation & Initial Reduction	Trimming & Shaping	Maintenance	Total
Florence A	106 (42.9%)	377 (28.6%)	10 (30.3%)	493 (30.8%)
Florence B	80 (32.4%)	803 (60.8%)	21 (63.6%)	904 (56.6%)
Flint Hills light gray	14 (5.7%)	49 (3.7%)	-	63 (3.9%)
Flint Hills green	3 (1.2%)	3 (0.2%)	-	6 (0.4%)
Wreford	4 (1.6%)	3 (0.2%)	-	7 (0.4%)
Cresswell	1 (0.4%)	6 (0.5%)	1 (3.0%)	8 (0.5%)
Indeterminate	37 (15.0%)	78 (5.9%)	1 (3.0%)	116 (7.2%)
Total	247 (100.0%)	1321 (100.0%)	33 (99.9%)	1601 (100.0%)

Table 3.6. Cross tabulations of chert types and sources for initial reduction and core preparation by-products.

Chert Type	Bedrock/Residual	Stream Cobble	Indeterminate
	Primary Decortication Flakes		
Florence A	3	3	-
Florence B	3	4	1
Flint Hills light gray	-	2	-
Flint Hills green	-	-	-
Wreford	3	-	-
Cresswell	-	-	-
Miscellaneous	-	1	-
Indeterminate	8	4	1
Total	17	14	2
	Secondary Decortication Flakes		
Florence A	70	6	24
Florence B	38	22	12
Flint Hills light gray	2	9	1
Flint Hills green	1	1	1
Wreford	-	1	-
Cresswell	-	1	-
Miscellaneous	1	-	-
Indeterminate	9	7	8
Total	121	47	46

gray chert is the reverse of that for Florence cherts, i.e., more stream cobbles were used. Perhaps bedrock/residual sources are few and/or far away; however, given the small number of specimens and unknown nature of occurrence, definite statements are impossible to make. Cross tabulations of chert types and nature of occurrences are given in Table 3.6.

In summary, the flake assemblage consists mainly of Florence chert, about 1/3 Florence A and 2/3 Florence B. Other cherts are present in low quantities. Florence cherts were procured from stream beds, upland residual deposits, and possibly bedrock sources in stream beds or at the eastern escarpment. Higher quality residual/bedrock chert was used more often than immediately available stream cobbles. Cresswell chert nodules may be obtained about 5 km. from the site, most easily from upland regoliths; a decortication flake from a stream cobble indicates that some Cresswell is available there. Wreford does not outcrop in the upper Walnut valley, but does occur in the southern Flint Hills. The same is true of Foraker chert, which is available in the lower Walnut and Little Walnut drainages about 25 km. south of 14BU25 (Banks n.d.:23).

Core Preparation and Initial Reduction

Flakes struck from pieces of raw material during core preparation and initial reduction retain cortex and/or patina on their dorsal surfaces (Collins 1974:471; Katz 1976:100; White 1963:5; Newcomer 1971:85-8; Patterson 1977:69; Skinner 1971:175-6). The first flake removed from a nodule or cobble of raw material has a completely cortical or patinated dorsal surface and is referred to as a primary decortication flake (White 1963:5) (Fig. 3.7a). Subsequent initial reduction flakes may be primary decortication flakes (Crabtree 1973:17), but they usually have dorsal surfaces only partially covered with cortex or patina and are called secondary decortication flakes (White 1963:5) (Figs. 3.7b, c; 3.8a). Flakes detached during the primary trimming process occasionally retain small amounts of cortex or patina, and therefore, if less than 10% of the dorsal surface is cortical or patinated, it is not classified as a secondary decortication flake (Collins 1974:167, 471; Newcomer 1971:88).

In addition to having cortical or patinated dorsal surfaces, flakes resulting from initial reduction activities are predicted to share several other characteristics. They should be the thickest and most massive of any flake class, flake angle should be larger than in subsequent stages, and platforms should have little preparation. Secondary decortication flakes will have more platform modification than primary decortication spalls, but preparation will still be limited. These features reflect the fact that a large amount of force is necessary to detach flakes from pieces of raw material and less control is exercised in doing so than in later steps (Katz 1976:104; Newcomer 1971:85-8).

A total of 33 primary and 214 secondary decortication flakes are included in the complete flake sample, comprising 2.1% and 13.4%, respectively, of the sample. All chert types, excepting Foraker, from both bedrock/residual nodules and tabloids and stream cobbles were initially reduced at the site (Tables 3.5 and 3.6). Most decortication debris is made of Florence A chert, even though Florence B is the predominant type

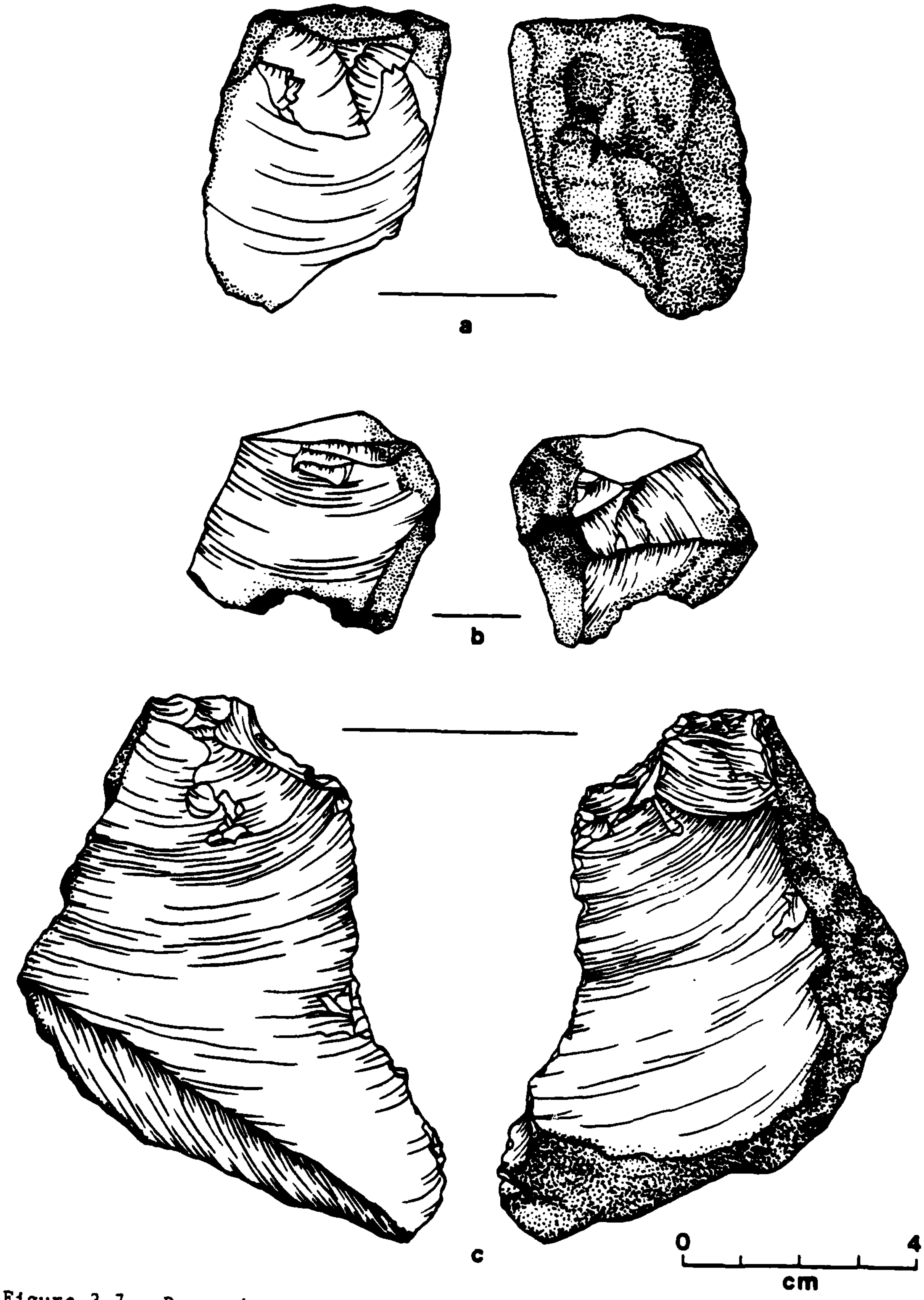

Figure 3.7. Decortication flakes: (a) primary decortication (A36758); (b) secondary decortication tabluar flake (A44024-28); (c) secondary decortication (A44001).

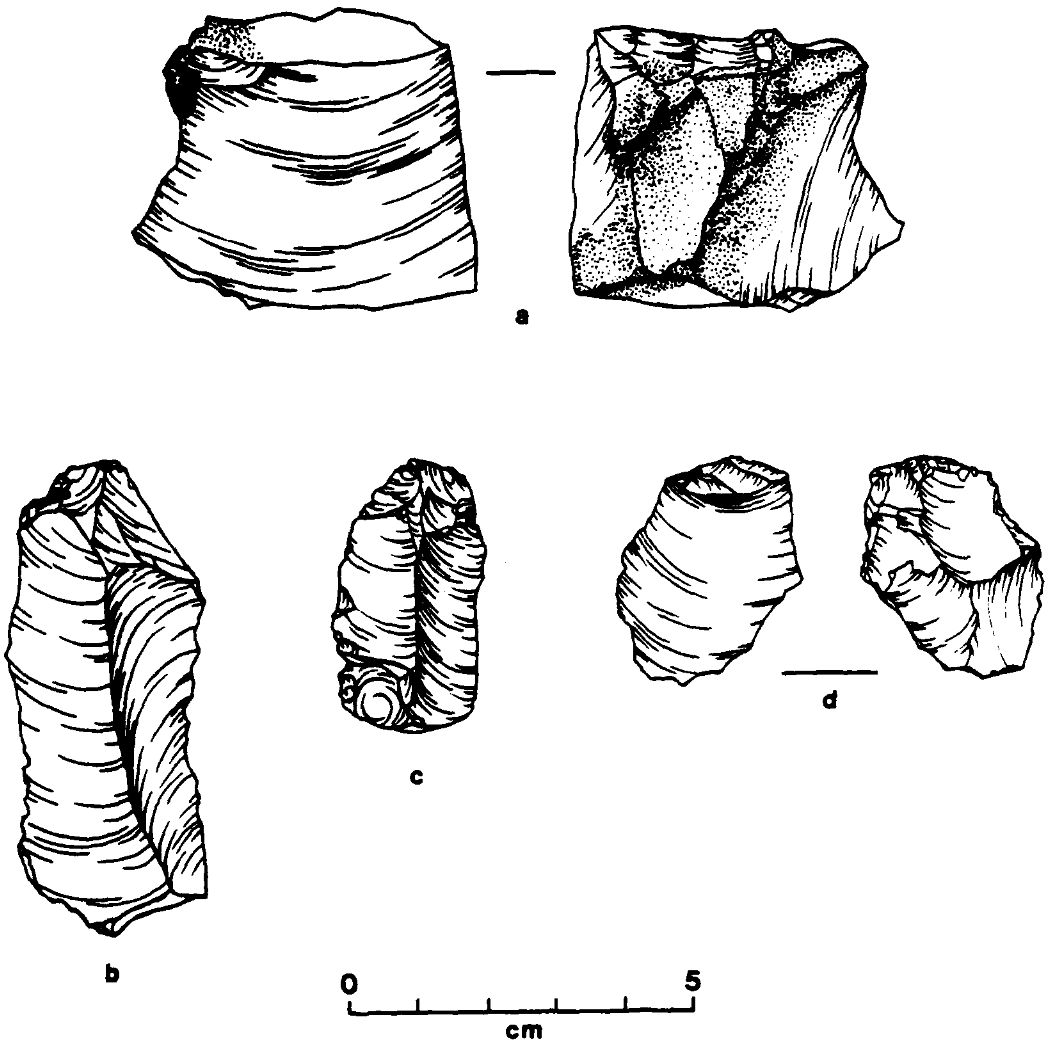

Figure 3.8. Flakes and blades: (a) secondary decortication tabluar flake (A44023-2); (b) blade (A12761); (c) blade (A35928); (d) bifacial thinning flake (A44141-5).

in the entire complete flake assemblage. Bedrock/residual, Florence A chert was initially reduced at the site more than any other kind. Given the proximity of river cobbles, it was expected that most cortical debris would be from cobble reduction; this is not the case. Of 199 determinate specimens, 138 (69%) represent initial reduction of bedrock/residual nodules and tabloids. Numbers of primary decortication flakes are about evenly divided between sources, 17 bedrock/residual and 14 river cobble; but there are 121 bedrock/residual secondary decortication flakes and only 47 from river cobbles (Table 3.6). The lower proportion of primary to secondary decortication flakes among bedrock/residual material may be due, in part, to the different morphologies of stream cobbles and bedrock/residual materials. Bedrock nodules may become so closely spaced that a solid layer 8 to 15 cm. thick is formed (Haury 1979a), which tends to break into tabular pieces. Cleavage faces are not always weathered enough to become patinated; thus, a piece may be knapped with no primary decortication flakes resulting. However, many bedrock and all residual nodules are covered with cortex, necessitating removal of primary flakes, usually large and irregular, during initial reduction and core preparation processes. Therefore, the lower proportion of primary flakes among bedrock/residual cherts (12%) compared to stream cobbles (23%) is probably not totally a result of differential cortex occurrence. More initial reduction of bedrock/residual chert was carried out off the site than was the case for stream cobbles. This inference is reasonable given the distances of residual and bedrock sources from the site.

However, the presence of primary and secondary decortication flakes in relatively high proportion (247 of 1601, 15%) supports an inference that much of the beginning step of tool manufacture was carried out on the site. Perhaps most reduction of bedrock/residual chert yielding primary decortication flakes was carried out off the site, while more, or all, reduction of river cobbles took place on the site. Proportion of complete decortication flakes is, however, a biased indicator of the true proportion of initial reduction activities. Because decortication flakes are thicker and heavier than other flakes, they break less often, resulting in over-representation in complete flake samples (Skinner 1971, Table 1). Additional biases are also introduced in this sample because small debitage (specimens whose largest linear dimension is less than 7.0 mm.) is not included.

Decortication flakes are the most massive of any class, confirming expectations. Decortication flakes are also the thickest and have the largest flake angle of any manufacturing step (Table 3.7). The thick, massive nature of many decortication flakes suggests that they were struck off using hard hammer percussion techniques (Sollberger 1968:106; Leakey 1960:41); smaller flakes may have been detached by any one of several techniques (Patterson and Sollberger 1978; Newcomer 1971).

Platform modification increases slightly among secondary decortication compared to primary flakes, and more faceted and plain platforms are present among secondary flakes. Most primary decortication flakes have unprepared cortical or patinated striking platforms (25 of 33; 75%); remaining platforms are either collapsed, plain, or faceted. Only one

ıble 3.7. Descriptive statistics for flake classes.

ʟake Class	Weight	Thickness	Flake Angle
:imary ᵻcortication	$\bar{X}$=4.2gm, s = 6.2 Range: 0.1-29.2gm n=33	$\bar{X}$=5.5mm, s = 3.3 Range: 0.7-14.7mm n=33	$\bar{X}$=75°, s = 20° Range: 30-112° n=29
ᵻcondary ᵻcortication	$\bar{X}$=5.7gm, s = 9.4 Range: 0.1-76.7gm n=214	$\bar{X}$=6.0mm, s = 3.8 Range: 1.2-27.7mm n=214	$\bar{X}$=66°, s = 16° Range: 27-120° n=191
:imming and ıaping	$\bar{X}$=1.9gm, s = 3.4 Range: 0.1-45.6gm n=1321	$\bar{X}$=3.4mm, s = 2.9 Range: 0.5-16.9mm n=1321	$\bar{X}$=63°, s = 16° Range: 27-115° n=1145
ıintenance	$\bar{X}$=1.3gm, s = 1.5 Range: 0.1-5.3gm n=33	$\bar{X}$=2.9mm, s = 1.1 Range: 1.0-5.2mm n=33	$\bar{X}$=51°, s = 13° Range: 25-72° n=33

ıird of secondary flake platforms are cortical or patinated (73 of 214; ȝ%), while half are either plain or faceted. Other platforms are ›llapsed, ground, or dorsally reduced (Table 3.8).

The high incidence of cortical and patinated platforms among primary .akes and the preponderance of plain and faceted platforms among second- ·y decortication flakes leads to several postulations which are supported ' analyses of those core and biface samples which are also by-products : initial reduction and core preparation (see below). The first posited ᵻquence of events is as follows: Stream cobbles and bedrock/residual ›dules had a primary decortication flake struck from a natural projection, ·oducing flakes with unprepared cortical or patinated platforms. This .eavage face then served as a platform for subsequent flake removal (cf. ıite 1963:5; Crabtree 1973:17), thus producing a few primary and more ımerous secondary flakes, serving to regularize the core face for subse- ıent blank detachment. Flake by-products of this process may or may not ıve been utilized. Similarly, more than one flake could be removed from ıe same cobble face in the first few blows, thus producing a few secondary :cortication flakes with cortical or patinated platforms. The resulting eavage face then served as the platform for subsequent flake removal. flakes were detached using the intersection of negative flake scars as place to apply force, flakes with faceted platforms would be produced. us faceted platforms do not necessarily represent preparation, but mply good places for the application of force (Collins 1974:164). An- her way by which primary and secondary flakes with unprepared cortical atforms were probably produced was by detaching a series of flakes from dules with a fortuitous flat surface, using that surface as a striking atform.

Nodules can also be reduced into core tools (Holmes 1919); decorti- tion flakes may be removed to either prepa⁻ᵓ platforms for subsequent duction or to shape an edge for use (Collirᴞ 1975:20-1). Initial reduc-

Table 3.8. Counts of platform states by flake class.

Platform State	Primary Decortication	Secondary Decortication	Trimming & Shaping	Maintenance
Unprepared Cortical	18 (54.5%)	65 (30.4%)	3 (0.2%)	-
Unprepared Patina	7 (21.2%)	8 (3.7%)	3 (0.2%)	-
Cortical with Dorsal Reduction	-	1 (0.5%)	-	-
Plain	3 (9.1%)	55 (25.7%)	387 (29.2%)	5 (15.2%)
Plain with Dorsal Reduction	-	1 (0.5%)	18 (1.4%)	-
Plain with Grinding	-	4 (1.9%)	58 (4.4%)	-
Faceted	1 (3.0%)	52 (24.2%)	583 (44.1%)	28 (84.8%)
Faceted then Dorsal Reduction	-	4 (1.9%)	16 (1.2%)	-
Faceted then Ground	-	1 (0.5%)	75 (5.8%)	-
Collapsed	4 (12.1%)	23 (10.7%)	177 (13.4%)	-
Indeterminate	-	-	1 (0.1%)	-
Total	33 (99.9%)	214 (100%)	1321 (100%)	33 (100%)

tion activities such as these would explain the large amount of small decortication debris. The reduction sequence would begin with selection of conveniently shaped nodules or tabloids. Flakes were then removed from the periphery of the raw material around part, or all, of the perimeter. Flakes could be removed all from one face first, then turning the piece over, the procedure would be repeated for the opposite side (cf. Holmes 1919:162). Alternatively, flakes could be removed by striking alternating sides with each blow, using resultant flake scars as striking platforms (cf. Skinner 1971:176). This sequence of events would produce many flake by-products which had plain or faceted platforms; only a few would have cortical or patinated platforms. Ground platforms might also be occasionally produced in the above trajectory. Given the relative frequencies of various platform states (Table 3.8), both reduction sequences may have occurred.

Only three of the 33 primary decortication flakes are thermally altered; none from river cobbles. About one third of the secondary decortication flakes show signs of heating (77 of 212 determinate specimens); only 15% of river cobbles are heated, while for bedrock/residual cherts the figure is 36%. Florence A chert also appears to be differentially heated (Table 3.9). It should be noted that thermal alteration does not mean, ipso facto, that thermal pretreatment occurred as part of the reduction process (Collins and Fenwick 1974). However, if alteration was due

Table 3.9. Proportions of thermally altered cortical flakes.[a]

Chert Type	Bedrock/Residual		Stream Cobble		Indeterminate	
	Heated	Not Heated	Heated	Not Heated	Heated	Not Heated
Florence A	32	41	2	7	17	7
Florence B	11	30	4	22	2	11
Flint Hills light gray	1	1	-	10	-	1
Flint Hills green	1	-	-	1	-	1
Wreford	-	3	-	3	-	-
Cresswell	-	-	1	-	-	-
Miscellaneous	-	1	-	1	-	-
Indeterminate	4	12	2	9	3	6
Total	49	88	9	51	22	26

[a]Specimens on which heat alteration is indeterminate (n=2) are not included.

to discard into fires, postdepositional burning, or some other process outside the manufacturing sequence, there should be no patterning in the occurrence of heated specimens. If heat alteration is patterned, i.e., certain raw materials or by-products and products of certain manufacturing steps are heated more often than others, purposeful behavior is implied (Collins and Fenwick 1974:140).

A chi square test is used to evaluate the hypothesis that heat alteration does occur in a patterned manner; Florence A and bedrock/residual cherts are heated more often than other chert types and river cobbles, respectively. Only Florence A and B cherts occur in large enough numbers to employ a chi square test; therefore, only they are used to test the hypothesis (Dixon and Massey 1969:240). The null hypothesis is, heat alteration and raw material type are independent variables, i.e., the distribution of one characteristic is the same, regardless of the other characteristic (Dixon and Massey 1969:240); the alternative is, the variables are dependent. Using data presented in Table 3.9, the calculated chi square statistic is 14.2; thus, the null hypothesis must be rejected and the alternative accepted, i.e., heat alteration and chert type are dependent (alpha=0.05) (the contingency table is presented in Appendix A, Table A.1). The inference that Florence A chert was heated more often than other types is supported. This conclusion assumes that heat alteration produces visually detectable changes in both cherts equally, which may or may not be the case.

To evaluate the significance of the apparent association of heat alteration and bedrock/residual cherts, a chi square is again employed. The calculated test statistic of 8.9 exceeds the critical value; the null hypothesis is rejected and the alternative accepted (alpha=0.05) (Table A.2). The inference that chert collected or quarried from bedrock or residual deposits was heated more often than stream cobbles is supported.

The above demonstration that Florence A chert and chert from bedrock/residual sources are differentially heated does not mean, ipso facto, these cherts were heated purposefully to improve workability. Chert may be heated during quarrying if fire is used to facilitate removal or to break up large pieces of raw material (Gregg and Grybush 1976; Holmes 1891, 1919:176-8, 198). The fact that chert from bedrock sources may be heated more often suggests this is a viable possibility. If thermal alteration took place only as part of quarrying activities, then primary and secondary decortication flakes will not be differentially heated. A chi square test is appropriate to evaluate the proposition. To reiterate data presented above, 3 of 33 primary and 77 or 214 secondary decortication flakes are heated. The calculated test statistic is 9.9; the null hypothesis is rejected and the alternative accepted (alpha=0.05) (Table A.3).

On the basis of chi square test results several inferences are justified. Thermal alteration occurred at least in part, outside of quarrying activities. Association of heating with Florence A chert and bedrock/residual sources suggests purposeful heating of selected kinds of chert. Although a few primary cortex specimens are heated, significantly more secondary decortication flakes are altered, suggesting unmodified raw materials were not systematically heated. Several secondary decortication flakes have potlid scars on their ventral surfaces demonstrating heating after detachment. In conclusion, secondary decortication flakes were thermally pretreated as a distinct technological operation possibly to improve knapping quality of the stone (Crabtree and Butler 1964; Purdy and Brooks 1971; Hester 1972; Mandeville 1973:191; Mandeville and Flenniken 1974). An implication of the above statement is that secondary decortication flakes served as blanks which were reduced further in the manufacturing sequence.

Optional Primary Trimming and Secondary Trimming and Shaping

Primary trimming results in detachment of noncortical blanks from cores and the initial shaping of flake and core blanks; many tools are completed in this step. Secondary trimming and shaping consists of final edge modification, including beveling, straightening, or notching (Collins 1974:21-2). In general, flake by-products of these steps become progressively less massive, thinner, have smaller flake angles, more platform preparation, and have at most a small amount of cortex on the dorsal surface (Collins 1974:471; Katz 1976:104-5; Newcomer 1971). Separation of these two steps is accomplished by isolating discontinuities in flake measurement distributions (Katz 1976:101; Newcomer 1971; Neumann and Johnson 1979:84-5).

A problem arises in the present study in trying to separate flake by-products of the two steps. No discontinuities are present in weight, thickness or flake angle measurements; histograms show unimodal, approximately normal or lognormal distributions (Fig. 3.9). The possible explanation for this observation that only one step is represented in the complete flake assemblage is not acceptable. Inspection of tools indicates that reduction of core and flake blanks entailing both primary and secondary trimming was part of the manufacturing process. There is a large range in flake size, 0.1 to 45.6 gm., indicating that both steps were probably carried out on the site. Many flakes resemble bifacial thinning flakes (Frison 1968; Shiner 1970:30-1; Hester 1971:106) (Fig. 3.8d), which suggests that biface shaping took place. Although flakes similar to bifacial thinning flakes may be produced from discoidal or perhaps polymorphic cores (cf. Binford and Papworth 1963:93), the predominance of bifaces in the tool sample certainly implies that biface reduction was prominent. The highly skewed distributions of weight and thickness also support the postulation that the entire range of biface manufacture is represented (Patterson and Sollberger 1978:105). Because no separation can be made, these flake classes will be treated together in the analysis.

The majority of complete flakes represent primary and secondary trimming and shaping. Even though final manufacturing steps are underrepresented due to exclusion of very small flakes, 1321 of 1601 flakes are indicative of these steps. Three blades are also represented in the sample (Fig. 3.8b, c). Tools made from Florence B chert were finished most often in or near the excavation space, in contrast with the predominance of Florence A decortication flakes; 803 Florence B flakes were recovered to 377 Florence A. The difference might be a result of different tool manufacturing trajectories for the two chert types, or simply due to biases introduced by differential activity set performance in different areas of the site or off the site. Results of tool analyses (see below) suggest the Florence A and B were both manufactured into the same light duty tool forms and that Florence A may have been slightly preferred. The majority of all bifaces are made from Florence A. Therefore, the relatively small amount of Florence A trimming and shaping debris implies that biases are present. There are 49 trimming flakes of Flint Hills light gray chert; other cherts are present in small numbers. Tool manufacture using all cherts but Foraker is indicated (Table 3.5). Chert source is determinate only on a few pieces; both stream cobbles and bedrock/residual nodules are represented.

Most platforms show some degree of preparation, including various combinations of faceting, grinding, and dorsal reduction. The most common platform state is faceted, consisting of double and multiple faceted specimens. Plain and collapsed platforms are the next most abundant states; various combinations of grinding and dorsal reduction in conjunction with plain and faceted states make up the remainder of the collection (Table 3.8). The predominance of faceted platforms, 10% of which are ground, supports the postulation that many of these flakes represent biface reduction (Crabtree 1973:19; Hester 1971:106; Shiner 1969:225). Faceting and grinding are accomplished in order to bevel and strengthen platforms during biface thinning. A marked increase in platform preparation

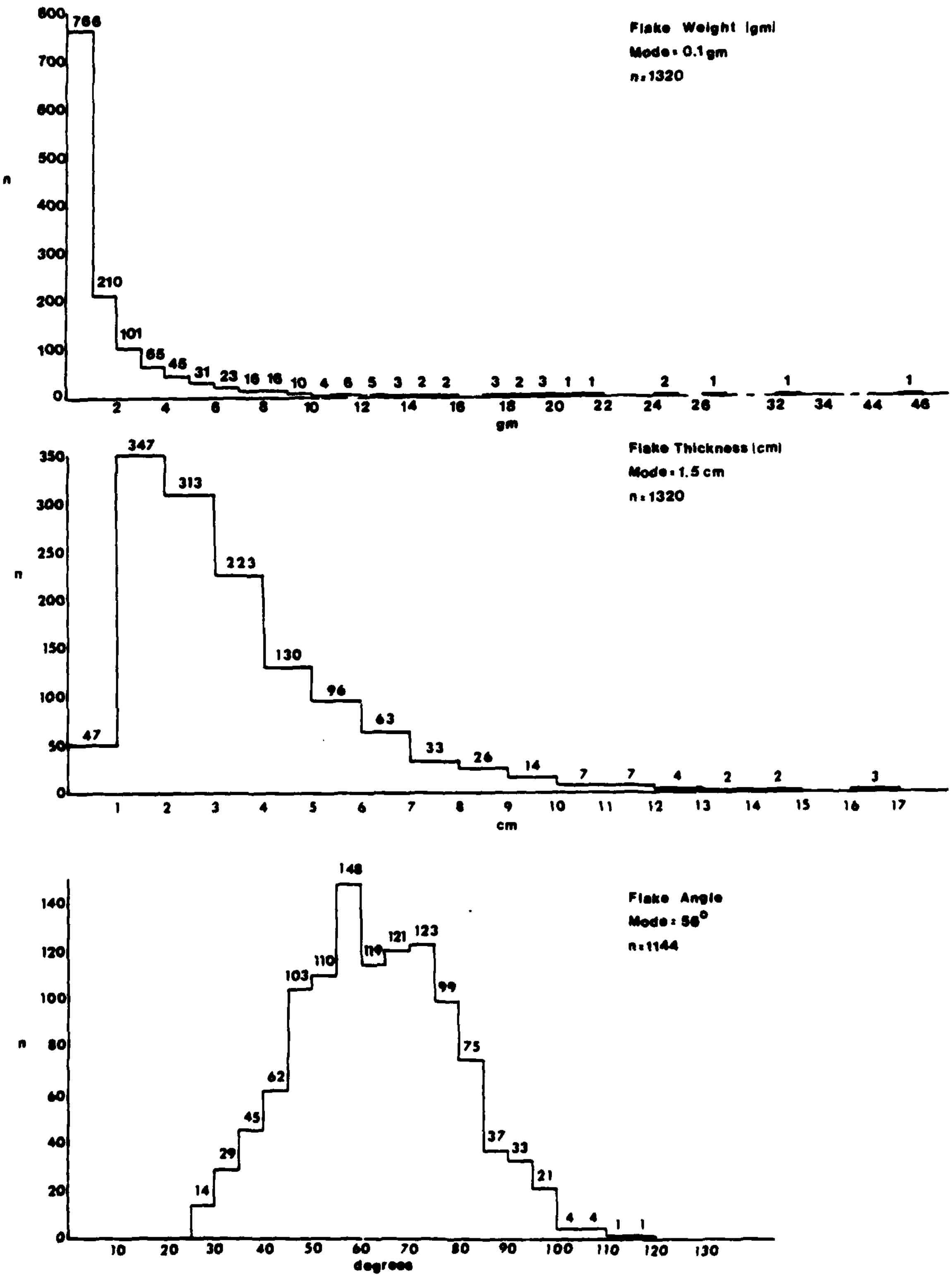

Figure 3.9. Histograms of trimming flake weight, thickness, and flake angle.

from initial reduction and core preparation flakes is apparent, in accordance with predictions.

The trends of decreasing magnitudes of weight, thickness, and flake angle continue, lending support to the postulated position of these flakes, and represented activities, in the reduction sequence. Mean weight is 1.9 gm., mean thickness is 3.4 mm., and mean flake angle is 63° (Table 3.7). These trends indicate decrease in force and, in conjunction with increased platform preparation, increased control in flake detachment.

Approximately one third of trimming and shaping flakes (449 of 1315) are thermally altered (Table 3.10); this does not differ significantly from the previous manufacturing step which produced secondary decortication flakes (77 of 212). The calculated chi square statistic of 0.52 implies that there is no evidence in the sample to suggest that heat treatment is associated with a particular manufacturing step (alpha=0.05) (Table A.4). This is surprising in light of suggestions that heat treatment increases control over flake removal (Crabtree and Butler 1964; Purdy and Brooks 1971; Mandeville 1973:191; Mandeville and Flenniken 1974), which is one of the characteristics of optional trimming and shaping steps (Katz 1976:104).

It was demonstrated above that secondary decortication flakes are heated more often than primary decortication flakes; supporting an inference of thermal pretreatment in the context of tool manufacture sometime after primary decortication flake removal. Observations show no difference in the occurrence of heat treatment between secondary decortication and trimming and shaping flakes. Assuming indications of thermal alteration are not removed in significant amounts by subsequent knapping, above statements imply thermal pretreatment did not occur immediately preceeding trimming and shaping.

Table 3.10. Proportions of thermally altered noncortical flakes.[a]

Chert Type	Trimming and Shaping		Maintenance	
	Heated	Not Heated	Heated	Not Heated
Florence A	256	121	7	3
Florence B	145	658	2	19
Flint Hills light gray	9	40	-	-
Flint Hills green	3	-	-	-
Wreford	-	3	-	-
Cresswell	-	6	1	-
Miscellaneous	1	1	-	-
Indeterminate	35	37	-	1
Total	449	866	10	23

[a] Specimens on which heat alteration was indeterminate (n=6) are not included.

Although taken as a group, trimming and shaping flakes are not differentially heated, Florence A chert specimens are. Fifty-one of 100 (51%) secondary decortication flakes are thermally altered while 256 of 377 (68%) of trimming and shaping flakes show signs of heating. To test the postulation that Florence A chert was heated more often, later in the manufacturing sequence than during initial reduction, a chi square test is performed. The calculated chi square value is 9.8, exceeding the critical value of 3.84 (alpha=0.05); the presence of heat alteration is dependent on the stage of manufacture (Table A.5). The association of heating with a specific chert type and a specific manufacturing step implies thermal pretreatment in the manufacturing sequence (Collins and Fenwick 1974:140). The predominance of heat treated Florence A flakes representative of trimming and shaping may indicate that Florence A was used more often than other cherts for manufacture of tools which required a high amount of control in flaking.

Trimming and shaping of tools were predominant lithic manufacturing activities carried out at 14BU25. Although flakes representative of these steps are produced in larger numbers than decortication flakes during the manufacturing process, especially for bifaces, their high percentage (82%) of occurrence in the complete flake sample is higher than would be expected if all manufacturing activities took place on the site (cf. Skinner 1971; Newcomer 1971; Newmann and Johnson 1979:85). Given the biases mentioned above which probably result in overrepresentation of cortical debris, these statements are even more likely to be true.

Maintenance and Modification

Tools may be resharpened, the process by which original attributes which are lost through use may be restored. Tools may also be modified into new forms (Collins 1975:23). Flakes produced during maintenance operations are identified by degradative wear on platforms and proximal flake dorsal surfaces (Frison 1968; Shafer 1970). Edge rounding, step faceting, and striations can be produced during manufacture (Frison 1968; Sheets 1973); but step facets resulting from use will be differentially rounded, those produced early in tool use showing more signs of wear than those produced later. Flakes from tool modification resemble trimming and shaping flakes and/or resharpening flakes. As such, modification flakes cannot be distinguished from other flake classes; these activities must be inferred from analyses of retouched tools. Resharpening flakes should be the smallest and thinnest of any class, representing modification of retouched tool edges (Katz 1976:105).

Only 33 complete resharpening flakes are present, comprising 2% of the total sample. The small proportion of these flakes may be conditioned by several factors. As the smallest and thinnest of any flake class, breakage rates may be higher than for other classes resulting in underrepresentation among complete flakes. Since small flakes are not included in the sample, a higher proportion of resharpening flakes may have been deleted prior to analysis. A final source of bias may be recognition, i.e., development of wear was not sufficient enough to be detected under low magnification. Given these potential sources of error, maintenance

activities inferred from flakes should be viewed principally in a qualitative manner.

Sample mean of weight, thickness, and flake angle all decrease from the previous step (Table 3.7). With one exception, maintenance flakes represent resharpening of bifaces (Frison 1968). The uniface resharpening flake is from either a side or end scraper; it is made of Florence B chert. Three chert types are represented among resharpening flakes, Florence A and B, and Cresswell (Table 3.5). Most platforms are faceted, as they were removed from biface edges (Table 3.7). The incidence of heat alteration does not change from the previous step; Florence A chert is heated more often than Florence B (Table 3.10).

Use

Unmodified flakes which were used as tools represent an important aspect of the activity structure of a site. It is possible that most, or at least many tasks were performed using unmodified flake edges (Hayden 1977:179-82; Gould et al. 1971:163). However, several problems are inherent in making analytical distinctions between utilized and unutilized pieces. First, not all utilized flakes necessarily exhibit visible use wear and secondly, edge damage resulting from use must be distinguished from that produced naturally or during manufacture.

All flakes may not be used long enough for visible edge damage to develop (Brose 1975; Newcomer and Keeley 1979:202-3). Although laboratory techniques, such as use of colorizers or metalization, or high magnification (up to 300x), may reduce potential error, the problem is not entirely eliminated (Keeley 1974:323-6; Brose 1975). An unfortunate consequence of these limitations, especially in the present analysis where low magnification is used, is that flakes recognized as utilized represent only a portion of those specimens which were actually used. However, edge scarring, rounding, and polish show up well in the magnification range employed. Therefore, techniques used to identify wear are adequate to produce a representative sample (Odell 1975:229). In addition, several thousand specimens are examined in this study, making use of more elaborate procedures somewhat impractical. Flakes may be abraded, scratched, and retouched by natural forces or by trampling by people and animals (Knudson 1971; Keeley 1974:327). The majority of lithic specimens from 14BU25 do not exhibit abrasion, and therefore, this may be discounted as a systematic source of natural alteration. However, numerous pieces have broken, irregular edges or edges that are crushed and/or step faceted. Because these features could easily have been produced by trampling or during refuse disposal, only flakes with rounded and/or polished edges are classified as utilized. Rounding refers to a tool edge cross section that forms a continuous, convex curve between both artifact faces; this is visible under low magnification. Polishing refers to a reflective surface. Minimal use on hard material may produce only crushing and step faceting, but most tool use results in rounding, and/or polish (Ahler 1971:81-7, 1979:305; Knudson 1979:280; Newcomer and Keeley 1979:199). Thus, some information may be lost by this necessary and sufficient condition for identification of utilized flakes, but serious biases intro-

duced by non-use related edge alterations are avoided. Because unretouched tool edges are the subject of analysis, confusion between edge damage produced through manufacture and that from use does not exist.

Several types of edge damage are noted which allow inferences concerning broad functional categories. Employing Ahler's system (1979) as a guide, edge damage is divided into two wear types, abrasive and flaking. Abrasive wear types include grinding, blunting, smoothing, and polishing. Flaking wear types consist of step flaking, crushing, irregular flaking, hinge flaking and snap flaking. Striations, if present, indicate the nature of tool movement (Semenov 1964).

Using the necessary and sufficient condition of presence of edge rounding and/or polish, 112 flakes are identified as utilized. There are two aspects of the present investigation concerning utilized flakes: (1) what kinds of flakes were selected?; and (2) what were they used for? Analysis of selection criteria proceeded by comparing certain quantitative and qualitative measures of the utilized flake sample with those of the complete flake assemblage. Variables considered relevant reflect size, i.e., length, width, and thickness; presence or absence of cortex; thermal alteration; and chert type. Assuming most, or all, flakes were not hafted, selection should have been for flakes large enough to be comfortably held while enabling the worker to exert sufficient pressure to accomplish the task at hand. Raw material, presence of cortex, and heat alteration may have an effect on working edge characteristics, and as such, may have played a role in the selection process.

Comparison of complete utilized flake dimensions with those of the entire flake sample indicates selection for large flakes (Table 3.11). Not surprisingly, mean values of length, width, and thickness for utilized specimens are substantially greater than values for all flakes. Chi square tests are used to evaluate hypotheses concerning selection based on nominal attributes. For the test involving chert type, only Florence A, Florence B, and Flint Hills light gray cherts are entered into the analysis because of small sample sizes of other raw material classes. Proportions of chert types, heat altered specimens, and cortical pieces do not vary significantly between utilized and unutilized samples (alpha- 0.05) (Tables 3.5, 3,6, 3.12). Chi square contingency tables are located in Appendix A, Tables A.6, A.7, and A.8. None of these factors seems to have been selected for or against. However, no primary decortication flakes were utilized, nor was utilization detected on any cortical edge. Size is the only variable investigated that influenced selection of flakes to be utilized.

Given the techniques employed in the present study, inferences concerning tool use can only be broad based, at best. Two general categories of tool motion relative to the working edge can be delineated. Unifacial wear results from one way motion transverse to the working edge, e.g., scraping, shaving, or planing. Bifacial wear is a product of motion parallel to the working edge (cutting, sawing), chopping, or scraping in two directions (Semenov 1964; Keller 1966; Tringham et al. 1974:188-91; Wylie 1975:4-22; Lawrence 1979:118-9). The nature of the substance worked with the tool may be divided into hard and soft categories. Working hard,

Table 3.11. Flake dimensions (14BU25).

Dimension	Utilized Flakes n = 31	All Complete Flakes n = 1601
Length	$\bar{X}$ = 45.7 mm. range: 21.6-75.3 mm.	$\bar{X}$ = 23.4 mm. range: 5.9-109.7 mm.
Width	$\bar{X}$ = 34.3 mm. range: 15.8-59.4 mm.	$\bar{X}$ = 20.2 mm. range: 0.9-73.3 mm.
Thickness	$\bar{X}$ = 6.2 mm. range: 2.3-16.8 mm.	$\bar{X}$ = 3.8 mm. range: 0.5-27.7 mm.

Table 3.12. Chert type, cortical state, and thermal alteration for utilized flakes.

Chert Type	Cortex		No Cortex	
	Heated	Not Heated	Heated	Not Heated
Florence A	5	3	17	13
Florence B	-	7	8	52
Flint Hills light gray	-	-	-	3
Miscellaneous	1	-	2	-
Indeterminate	-	1	-	-
Total	6	11	27	68

resistant material (bone, antler, hard woods) most often produces step faceting in conjunction with hinge flaking, irregular flaking, blunting and/or smoothing. Edge degradation from working soft materials (hide, meat) is usually restricted to irregular flaking, smoothing and/or polish; step flaking does not occur (Tringham et al. 1974:188-91; Ahler 1971:82-7; Wylie 1975:4-22; Gould et al. 1971:159; Lawrence 1979:118-9). Minimal step flaking may occur during meat or hide cutting if the tool comes into contact with bone (Ahler 1971:83-6).

Various combinations of blunting, smoothing, polishing, step flaking, irregular flaking, hinge flaking, and snap flaking are present on flake margins from 14BU25. The sample is about evenly divided between unifacial (n=55) and bifacial (n=57) wear. The predominant unifacial wear pattern consists of step flaking in conjunction with smoothing and irregular flaking. Step flaking, occurring with various combinations of blunting and irregular and hinge flaking, makes up the edge damage configuration on 47 of the 55 flakes with unifacial use wear. Plan view shapes of these working edges are straight, concave, convex, or irregular (combinations

of the first three forms). Concave and irregular edges may be indicative of scraping cylindrical wooden shafts or similarly shaped pieces of bone or antler. Straight and concave edges could have been used for the same purposes or for various other wood, bone, or antler working tasks (cf. Hayden 1977:185). The eight flakes with no step flaking on the working edge may have been used to scrape flesh and fat from animal hides or to soften or otherwise prepare skins. One specimen (A44138-1) has striations oriented perpendicular to the working edge along a small portion of that edge, supporting an inference of transverse motion.

Most flakes with bifacial use wear exhibit step flaking (30 of 57), but not in as large a proportion as observed on unifacially worn specimens. Step flaking occurs in association with smoothing, blunting, polishing, and irregular, hinge, and snap flaking. These flakes were used to cut, saw, or bifacially scrape wood, bone, and/or antler. Observed edge damage patterns are summarized in Appendix B, Table B.1. The absence of crushing and sporadic occurrence of blunting implies pressure, rather than percussive, forces were employed during tool use. Specimens which lack step flaking are invariably smoothed with either polish, hinge, and/or snap flaking. Inferred functions of these tools are cutting or sawing of soft materials, two way scraping of hides, or perhaps limited woodworking (Tringham et al. 1974:188-91). Another difference between bifacially and unifacially worn flakes is the scarcity (only 2 of 57) of concave working edges among bifacial specimens (Table B.1) Perhaps this is a reflection of cutting and sawing functions as opposed to scraping. General categories of use are summarized in Table 3.13.

Unmodified flakes were selected for use based on size. Large flakes (between 21.6 and 75.3 mm. in length) were utilized, although the largest flakes in the complete flake sample were not. Chert type, presence of cortex, and thermal alteration played no role in the selection process. Apparently, flakes selected for use were those which could be comfortably held and that had an edge appropriate for the task at hand (cf. Gould et al. 1971:154; Hayden 1977:179-83). Cutting, sawing, and scraping of hard and soft substances are inferred from the presence of various kinds of edge degradation. Absence of crushing and severe step flaking on working edges suggests that pressure, as opposed to percussion, contact occurred during use.

Summary of Flake Analyses

All manufacturing steps are represented in the flake sample from 14BU25. Stream cobbles, residual nodules, and probably bedrock nodules and tabloids were brought to the site and reduced. Tools were probably manufactured from flake blanks and directly from nodules of raw material. Flakes were utilized for various cutting and scraping tasks. Bifacial and unifacial tools were also resharpened on the site. Although all manufacturing steps are represented, the predominant flint knapping activity represented in the sample is tool finishing.

The twc types of chert which occur naturally in the greatest quantities were the types most often knapped at the site by prehistoric inhabi-

Table 3.13. Use inferences from utilized flakes.

Use Inference	Number of Artifacts
Hide scraping	8
Scraping hard substances (e.g., wood, bone, antler)	47
Light-duty cutting (e.g., meat, hides)	27
Heavy-duty cutting (e.g., wood, bone, antler)	30
Total	112

tants of 14BU25. Florence A and B cherts were collected from stream beds, residual deposits, and bedrock deposits. Although a plentiful supply of stream cobbles was available just off the site, more distant bedrock and residual deposits were exploited more often. It is hypothesized that cherts from the latter locations have more predictable fracturing properties than do stream cobbles. Stream cobbles may have been used most often for manufacture of tools requiring less control in the knapping process.

Bedrock/residual and especially Florence A cherts were thermally altered more than other kinds, implying thermal pretreatment. If cherts were systematically heated to improve workability, then it would be expected that heated Florence A chert might be manufactured into tools which required greater control in the knapping process, i.e., more complex forms. This proposition is supported by subsequent tool analyses. It is obvious that biases are present in the flake sample due to unequal representation of all manufacturing steps for all chert types.

Bifaces

This group of tools includes all bifacially retouched artifacts that are invasively flaked on at least one surface. Bifaces are grouped into preforms and finished tools. Preforms have striking platforms remaining on tool edges, finished tools do not (Reid 1978:120). Finished tools are further divided on the basis of working edge placement in relation to the tools' longitudinal axes. This procedure produces three mutually exclusive morphological groups which are also functionally distinct (cf. White 1963). The three groups are bifaces with: (1) distally converging lateral working edges, (2) transverse working edges, and (3) ovate or circular working edges (cf. White 1963; Montet-White 1968; Reid 1978).

Nominal data recorded for all specimens are raw material type, blank type (flake, tabloid, nodule), presence or absence of thermal alteration, mode of occurrence (bedrock/residual, or stream deposit), working edge cross sectional shape (plano-convex, biconvex, or both), and working edge damage patterns (see Flake Use for techniques employed). Some of these observations are indeterminate for given specimens. Length, width, thickness, and weight are recorded for each complete artifact.

Bifaces with Distally Converging Lateral Working Edges (n = 164)

This group includes all invasively flaked bifacial tools that have lateral working edges which converge to a point, narrow curve, or broad arc. The sample is made up of 33 complete and 131 broken artifacts. To anticipate a later conclusion, the high percentage of broken artifacts is indicative of the fact that most tools were discarded due to breakage during use, maintenance, and modification processes (cf. Jelinek 1976:21). These artifacts are further classified as to whether or not they have been modified for hafting by the preparation of a stem. Additional observations and measurements are taken for stem elements, namely lateral and basal stem edge shape, stem length and width, and stem basal width. The measurements are taken as defined by Montet-White (1968:51).

Stemmed Bifaces (n = 69)

Twenty-three complete and 46 broken stemmed bifaces are included in the sample from 14BU25. Production of these tools represents the most complex set of manufacturing procedures represented in the lithic artifact sample from 14BU25. It is hypothesized that these tools represent part of a hunting-butchering tool kit which functioned as both projectiles and generalized butchering/processing tools. Nonprojectile use was probably limited to light-duty cutting and scraping tasks (Frison 1978:318). These artifacts are analyzed in terms of manufacturing procedures and patterns of utilization. Metric data are presented in Appendix C, Table C.1; eleven specimens too fragmentary to make any measurements are excluded.

Manufacture: Florence A, Florence B., Flint Hills green and miscellaneous cherts were all selected for manufacture into stemmed bifaces. Chert was thermally pretreated during the manufacturing process. Florence A chert is almost invariably heat treated; 31 of 33 specimens show indications of alteration (Table 3.14). Tools were manufactured on flake blanks. A portion of an unretouched flake blank ventral surface and/or remnant platform is present on four pieces (e.g., Fig. 3.11e). No direct evidence concerning chert source location remains on stemmed bifaces. However, it is possible that raw materials used to manufacture stemmed tools were obtained from bedrock/residual sources. This chert generally has fewer internal heterogeneities that cause unpredictable fractures than stream cobbles do. Furthermore, unstemmed bifaces with converging lateral working edges were manufactured predominantly, and perhaps exclusively, from bedrock/residual cherts.

There is little evidence to support a hypothesis stating that the production of flake blanks which were modified into stemmed bifaces was a part of the same lithic subsystem represented by the cores recovered from the site. Mean negative flake scar lengths on core types made from bedrock/residual cherts are 20 to 30 mm. smaller than mean biface lengths. Mean negative flake scar length for Florence A core specimens is also more than 20 mm. smaller than finished tool size (see core analysis below). Of course, larger stemmed biface flake blanks may have been detached early in core reduction. There is direct evidence on some core faces that the largest flake scars were partially obscured by subsequent

'able 3.14. Stemmed bifaces: cross-tabulations of chert type and thermal alteration.

:hert Type	Heated	Not Heated	Total
'lorence A	31	2	33
'lorence B	6	25	31
'lint Hills green	1	-	1
liscellaneous	1	3	4
'otal	39	30	69

ıodification. However, the largest flake scars are all on large cores ıanufactured on stream cobbles, a raw material not used in stemmed biface ıanufacture.

With these facts in mind, it is postulated that another system of lake blank production may have been operative. Two possibilities exist: 1) flake blanks were produced off the site, probably at bedrock/residual ource locations, or (2) large flake blanks were produced during the manu-acture of large bifacial tools. The first alternative implies the resence of large cores at quarry or collection sites. No quarry sites ave been located in the El Dorado area, although systematic survey of he uplands along the eastern escarpment has not been accomplished. The econd alternative implies the existence of a technique similar to the :obden technique described by Montet-White (1968:27-8). This technique s one by which flakes detached from pieces of raw material were utilized nd these "cores" were subsequently manufactured into bifacially retouched ools, thus producing a continuum between cores and retouched tools. As 'ill be shown below, some bifaces were manufactured by directly reducing odules and tabloids of raw material. Employment of a technique similar o the Cobden one at Milbourn would explain the low frequency of cores nd core fragments (n=25). However, direct evidence in the form of large ores similar to Cobden type cores (over 10 cm. in diameter) is lacking. 'herefore, given the present scant data base, both alternatives remain lausible.

Flake blanks were bifacially reduced until relatively thin, long, vate tools, usually with convex bases were produced. At this stage in he production sequence, modification for hafting took place. This occur-ed in all, but perhaps three, cases by chipping notches in the base or ide of tools, thereby producing stems. The three possible exceptions ave stems which are wider than the blade portion of the tool. However, s argued below, these may represent extensively resharpened tools that 'ere originally notched. Stem preparation was always accomplished by ully symmetric flaking. That is, retouch of stem edges proceeded by emoving flakes from four opposite and alternate directions resulting in ouble beveled (biconvex), bifacially retouched edges (see Montet-White 968:55). Variations in the placement of the initial point of impact and

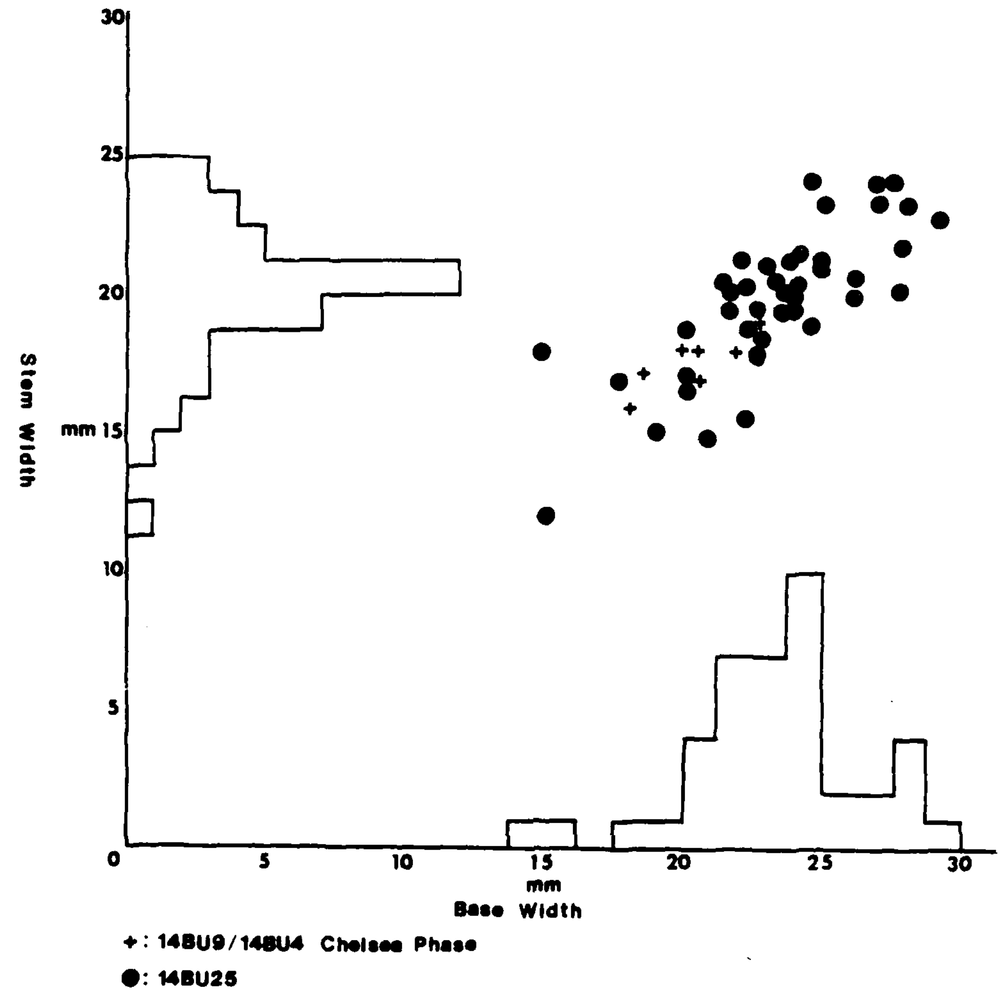

Figure 3.10. Scatterplot of stem width and base width for stemmed bifaces from 14BU25 and Chelsea phase deposits at 14BU9 and 14BU4.

subsequent stem modification resulted in corner-, basal-, side-, and modified-notched tools. These notching variations form a continuum, especially corner- and basal-notching.

Stem shapes associated with these notching variations are expanding, parallel, or contracting lateral edges and concave, convex, or straight basal margins. Stems are defined as expanding if basal width exceeds stem width by more than 2 cm.; parallel, if the absolute value of the difference is less than or equal to 2 cm.; and contracting, if stem width exceeds basal width by more than 2 cm. A scatter plot of stem versus base width illustrates an overall continuity in stem shape (Fig. 3.10). The distinctions defined above are maintained herein, however, because of possible variations in hafting. Most stems have expanding lateral edges and convex bases (40 of 54 determinate cases), although all combinations of base shape occur in conjunction with expanding and parallel lateral edges. The single example of a contracting stem has a straight base (Table 3.15). The different stem configurations cross cut variations in notching patterns. These modes of stem preparation are discussed below.

Corner-Notched (n = 28) (Fig. 3.11): Hafting elements on corner-notched bifaces were prepared by first removing a lunate-shaped flake from a corner of the base. The artifact was then turned over and the process was repeated. Some artifacts had more than one series of lunate-shaped flakes removed, producing deep notches. The notch was further modified by removal of several small flakes along the notch margin which evened and widened the opening. The bevel at the end of the notches is crushed; Crabtree (1973:29) suggests that this eliminates sharp edges for hafting. Bases are lightly to moderately ground in 21 cases, probably also to facilitate hafting. The notching procedure was the same for both notches on a tool. The technique of notching is not known. It has been suggested that Middle Woodland tools were notched by direct percussion (Montet-White 1968:56). However, Crabtree contends that notching was most often accomplished by pressure flaking, although indirect percussion was sometimes used (1973:28).

Table 3.15. Stemmed bifaces: cross-tabulations of stem lateral and basal shapes.

Basal Shape	Lateral Edge Shape			
	Expanding	Parallel	Contracting	Indeterminate
Convex	40	5	-	2
Straight	1	2	1	-
Concave	3	1	-	-
Indeterminate	-	-	-	13
Total	44	9	1	15

Basal-Notched (n = 7) (Fig. 3.12g, h): The basic process of basal-notching is similar to that described for corner-notching, but initial flakes were removed from the base rather than the corner. In all cases, several series of flake detachments were carried out, creating deep notches. Bases are lightly to moderately ground in all but one case. In this instance, steep marginal retouch flakes were removed from one side of the base producing a steep single bevel. This served to dull the base as did grinding.

Side-Notched (n = 5) (Fig. 3.12c, d): To manufacture side-notched tools, a lunate flake was removed from a lateral edge, several centimeters above the base. Smaller flakes were then removed from the opposite or both sides which served to widen and deepen the notch. Four of the five members of this group have ground bases; the remaining member has a strongly concave base.

Modified-Notch (n = 4) (Fig. 3.12a, e, f): A modified-notch was made by removing a lunate-shaped flake from a tool's lateral edge in much the same manner as for side-notched tools. The entire lateral edge, from the point of original flake detachment to the base, was then retouched. This procedure resulted in straight to concave lateral stem edges that are either expanding or parallel.

Stemmed (Unnotched) (n = 3): Two of these tools have stems which fit well within the range of variability for notched tools. One has an expanding stem, the other a parallel sided stem; both have convex bases. These tools would be considered "drills" in some classification systems. However, given the similarity in hafting modifications, it is hypothesized that these tools represent extensively sharpened, notched tools. The remaining unnotched tool has a contracting stem and is unique in that respect in the assemblage (Fig. 3.12i); it might not have been hafted at all.

Hafting: Hafting elements of all stemmed bifaces are relatively homogeneous, with the exception of one contracting stemmed tool. The single contracting stemmed biface may have been hafted differently than the remainder of the tools, or possibly, not hafted at all. Edge damage patterns on the stem include smoothing, blunting, and step fracturing, raising the possibility that this part of the tool was also employed as a working edge. This damage pattern differs from the evenly rounded edges which result from grinding on other stems. As such it will be excluded from the following discussion. One stem has identical stem and base width measurements, the remaining stems all have base widths that exceed stem widths. (Remember that "parallel stems" have stem and base width measurements which differ by less than 2 cm.).

One efficient method to haft expanding stemmed tools is by a modified split shaft, where the widest portions of the base protrude from the haft margins. The width of the stem between the notches is an approximate indicator of shaft diameter. Notches allow a relatively narrow shaft to be used in conjunction with wide blades (Frison et al. 1974:110). Corner-notched bifaces, similar in outline form, but slightly smaller than the Milbourn sample (3.5 cm. long), were found still hafted to foreshafts at Spring Creek Cave (Frison 1965, 1978:59-60). Although the site dates from A.D. 200 to A.D. 500, considerably later than Milbourn, hafting technique

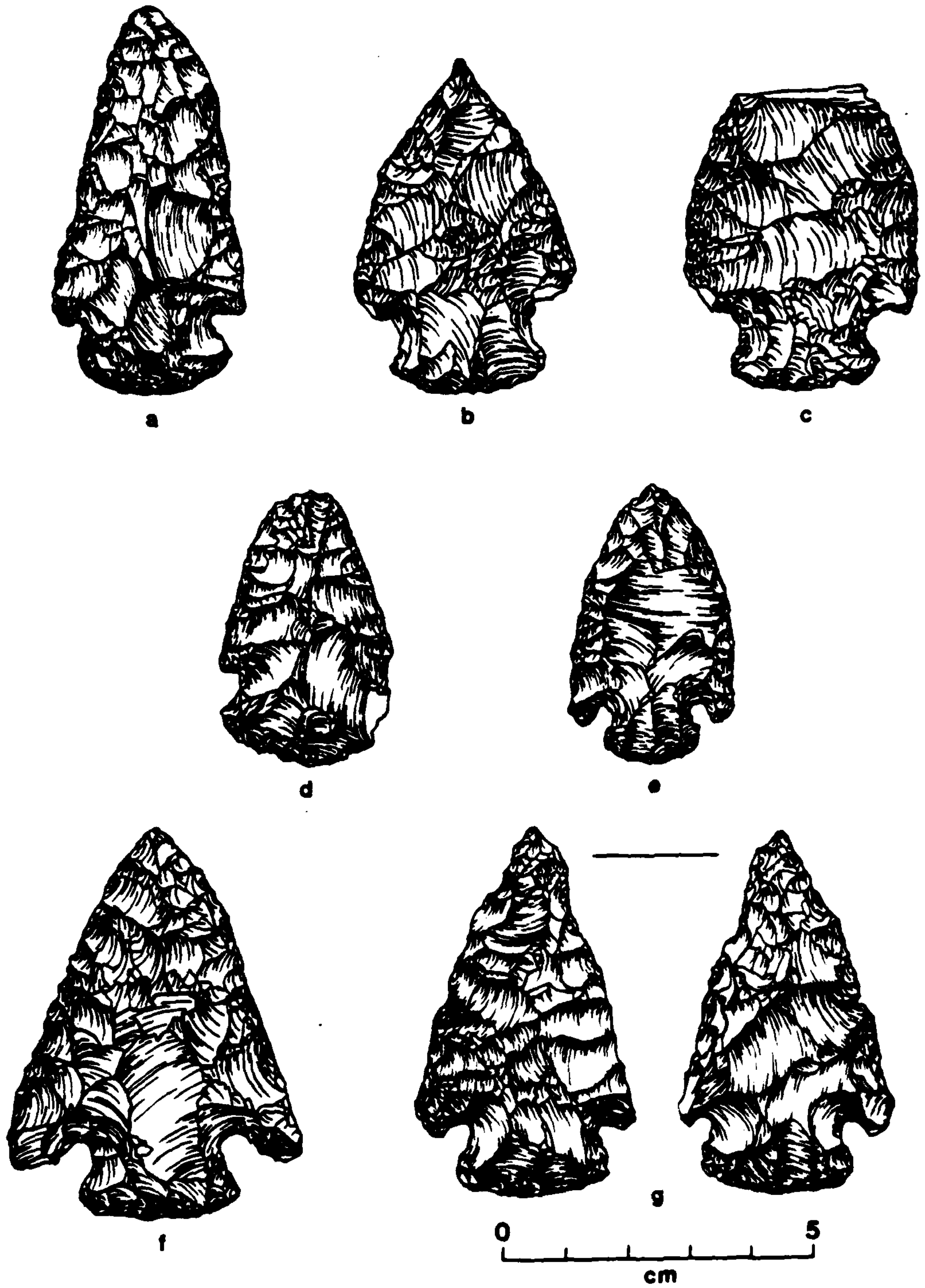

Figure 3.11. Corner-notched bifaces from 14BU25: (a) A35493; (b) A4835: (c) A15883; (d) A35697; (e) A12830; (f) A44189; (g) A4927.

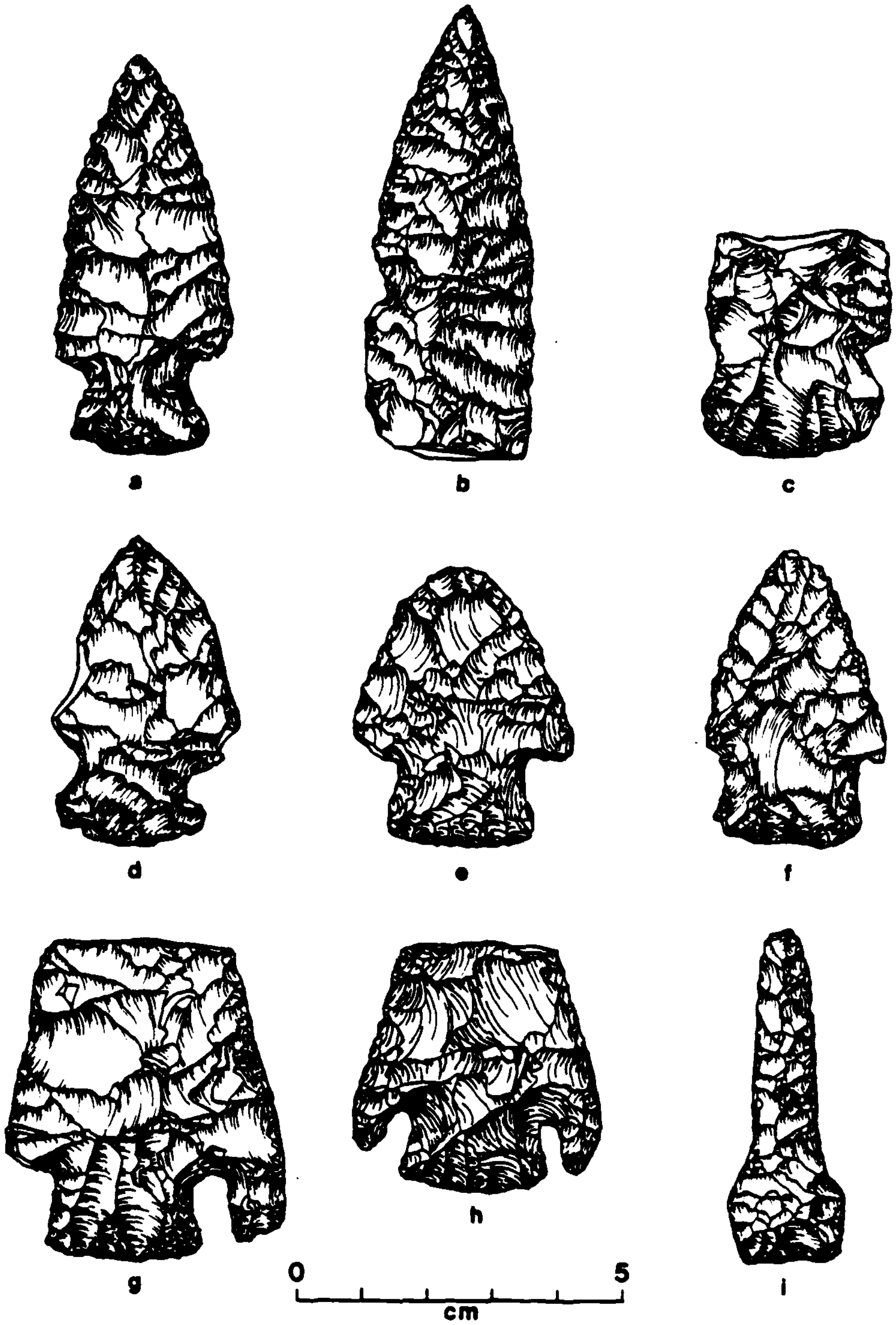

Figure 3.12. Stemmed bifaces from 14BU25: (a) modified-nothced (A44190); (b) lanceolate (A44093; (c,d) side-notched (FN1719, A4873); (e,f) modified-notched (A4834, A44113); (g,h) basal-notched (A16101, A4944); (i) stemmed (A16983).

may have been similar. Wooden foreshafts from Spring Creek Cave had a pair of V-shaped cuts made into their distal ends which produced nocks into which stems were fitted. Tools were bound to foreshafts by a criss-crossed sinew binding which was wrapped from the notch on one side to the opposite foreshaft shoulder, i.e., just below the protruding basal edge. Pitch was also used to secure the tool (Frison 1965:89, 1978:59).

Hafting in a split foreshaft is hypothesized to be the predominant method of mounting stemmed tools represented at Milbourn. Forty-four of 54 determinate specimens have expanding stems, as defined above. Basal corners would have protruded from haft binding in the manner pictured by Frison (1978, Fig. 2.11). These small tips would probably be subject to frequent breakage, as appears to be the case with a specimen illustrated by Frison. Among the Milbourn sample, 17 tools have broken basal corners supporting the hypothesis of split shaft hafting.

Other methods of hafting tools might also have been used. Parallel stemmed bifaces may have been socketed, as has been postulated for basal-notched tools recovered from the Coffey site in the northern Flint Hills (Miller 1979). It is postulated that these tools served to tip projectiles, as generalized cutting implements and occasionally as scraping tools. Not all artifacts exhibit evidence of all uses, but in general, most were multifunctional.

Several examples will serve to illustrate the type of complex use-lives some of these tools had. One corner-notched tool (A4927, Fig. 3.11g) has an impact fracture running down one blade face. This is direct evidence for use as a projectile point. The distal end was subsequently repaired by chipping a new point. One lateral blade margin is steeply beveled by the short flake removal technique of resharpening. This resharpening allows rejuvenation of thin bifaces with a minimum of material loss (Sollberger 1971). Lateral edges exhibit smoothing and blunting, edge damage becomes more pronounced along the distal portions of the blade. These edge damage patterns are consistent with those produced by use as a projectile and butchering tool (Ahler 1971:82-7). Another corner-notched specimen has a blunt convex distal end. This portion of the tool is steeply beveled by unifacial retouch. The edge is heavily rounded and polished and exhibits faint edge perpendicular striations. These patterns are indicative of scraping soft materials such as hide (Semenov 1964; Wylie 1975; Ahler 1979). Flake scars cross cut areas of heavy wear demonstrating that the working edge has been resharpened. Lateral edges are thin and relatively sharp and exhibit slight smoothing. This wear might be the result of carving meat or cutting hides. Evidences of use reported herein are usually the last and/or heaviest uses of potentially long use-lives. The convention here is not that these tools were not used to arm projectiles, most probably were, but that they were also employed for a variety of other tasks.

Tool uses are inferred from edge damage patterns following the system devised by Ahler (1979). However, damage patterns are not systematically quantified, although relative amounts of damage were noted on some specimens. Various combinations of polish, smoothing, blunting, step fracturing, and hinge fracturing are present on most tools. Damage ranged from

slight (visible under 30 to 40x) to pronounced (visible with the naked eye).

One of the most unambiguous indicators of use is the presence of impact fractures; these usually result from projectile impact (Ahler and McMillan 1976:166). Flakes removed from impact extend from an artifact's tip toward the base. Occasionally large flakes are removed which resemble channel flakes. Impact flakes are sometimes driven off the edges of blades rather than blade faces. Tips may also be crushed and/or snapped off upon impact (Frison 1974:95-7; Bradley 1974:194). All of these forms of damage are present in the stemmed biface sample. Ten tools exhibit impact fractures (e.g., Fig. 3.11g); seven corner-notched and three specimens without bases. Another set of observations also suggests projectile use. There are seven stem fragments which exhibit lateral snaps at probable stem/blade junctures. Judging from illustrations of Hell Gap projectile points, this type of fracture is common on projectile tips (Frison 1974, Figs. 1.39, 1.40, 1.41, 1.43). It is possible that these tools were broken during hunting expeditions and returned to the site for repair (cf. Judge 1973:204).

Projectile points must have several morphological attributes to function properly as killing implements. These are: (1) a sharp point to penetrate the hide, (2) sharp distal blade margins to cut a hole wide enough for the shaft to enter and ensure deep penetration, and (3) a hafting element designed to absorb the force of penetration without splitting. One broken and three complete stemmed tools without impact fractures embody such characteristics (A44190, Fig. 3.12a; A4834, Fig. 3.11b; A4873; A44093, Fig. 3.12b). These tools are modified-, side-, and corner-notched, demonstrating that several kinds of stem modification were suitable for projectile use. The broken specimen is the distal portion of a lanceolate tool (Fig. 3.12b). Although the stem is missing, the tool embodies the morphological characteristics and wear patterns expected for projectile points and thus, hafting for projectile use is inferred. The side- and modified-notched, and broken specimens both have slightly smoothed lateral edges, becoming more pronounced toward the tip. These characteristics are indicative of projectile use (Ahler 1971:82-7).

However, not all stemmed bifaces exhibit the attributes necessary to be effective penetrating tools. Lateral edges converge distally in forms ranging from narrow arcs to gentle curves; these tools could not have functioned as projectiles in their present form. However, most of these speciment show signs of reworking in the form of beveled edges, small retouch scars removing areas of heat discoloration, and/or thinned distal ends. Some of these tools have single beveled distal ends which exhibit heavy smoothing and polish that extends unifacially onto the bevel. This type of wear is indicative of scraping hides. Lateral edges are variously smoothed, polished, blunted, and step fractured. They were probably used as general light-duty butchering/processing tools. Whether or not these tools once functioned as projectile points is empirically indeterminate.

Not including small or reworked impact fractures, 46 stemmed bifaces are broken. Fracture types observed include transverse breaks associated with points of impact for flake removal and also not associated with

impacts, thermoclastic fractures, and large impact fractures. Transverse breaks which originate at a point of force result from too heavy a blow during manufacture or reworking. Transverse fractures not associated with points of force are initiated by lateral stress from use or heavy blows during chipping. Thermoclastic fractures usually occur when pieces are heated or cooled too rapidly, but crenated fractures also occur during knapping subsequent to thermal alteration (Purdy 1975). All tools exhibit edge damage which is inferred to have resulted from use. Therefore, fractures are inferred to have resulted from use and/or knapping errors during resharpening or modification processes. Thermoclastic fractures may have come about by miscalculations during the heating process or by postdepositional alteration. Several tools were used after they were broken. Edge damage extends onto fracture surfaces from tools' edges. Unmodified breaks have also been utilized for scraping hard surfaces, indicated by unifacial step fracturing and smoothing, and retouched and used as scraping tools. Twelve tools show signs of utilization on a break surface.

It is hypothesized above that many specimens have been resharpened and/or reworked and have been used for a variety of tasks. This functional heterogeneity suggests mounting in a removable foreshaft (cf. Ahler and McMillan 1976:162). If tool blades have been modified while remaining hafted, then blade portions of tools should exhibit more variation than hafted portions. To test this hypothesis, the coefficient of variation of blade length, width, and thickness is compared to stem length and width and base width. The coefficient of variation is a relative measure of dispersion useful in comparing distributions with means of varying magnitudes. The coefficient of variation is the standard deviation expressed as a percentage of the arithmetic mean (Parl 1967:73). In this test the unique specimen with a contracting stem is not included because the tool might not have been hafted. Coefficients of variation of all blade measures exceed those for hafting elements (Table 3.16). Thus, the hypothesis is supported; blade dimensions are relatively more variable than hafts.

To summarize, stemmed bifaces were used to tip projectiles, scrape soft materials such as skins, butcher, and process animals. Types of edge damage and fracture cross cut all categories of stem preparation suggesting functional equivalence; all stem classes representing multipurpose tools. This is contrary to some conclusions drawn from Rodger's

Table 3.16. Coefficients of variation for stemmed biface measurements.

Measurement	n	$\bar{X}$ (mm.)	s	C.V. (100 s/$\bar{X}$)
Blade Length	22	39.5	8.53	21.59
Blade Width	38	34.4	6.64	19.30
Blade Thickness	38	7.7	1.32	17.14
Stem Length	45	13.4	1.96	14.63
Stem Width	46	20.1	2.74	13.63
Base Width	45	23.5	2.95	12.55

Shelter Archaic material (Ahler 1971). However, sample sizes of all stem categories but corner-notched are small from Milbourn. Edge damage patterns are summarized in Appendix B, Table B.2; postulated uses are listed in Table 3.17.

Unstemmed Bifaces (n = 95)

Ten complete and 85 broken tools were recovered from the excavations. These tools are functionally similar to stemmed bifaces, except that no evidence of projectile use is present. In general, these tools are larger than stemmed specimens (Appendix C, Table C.2), but manufacturing procedures were similar, with the exception of the secondary edge trimming and shaping entailed in stem preparation (Fig. 3.13a, b, c).

Manufacture: Unstemmed bifaces were manufactured predominantly with Florence A chert, although Florence B was extensively employed. Almost all Florence A has been thermally altered (47 of 51 pieces). Only evidence for the reduction of bedrock/residual cherts into unstemmed bifaces is present (Table 3.18). Original flake blank ventral surfaces remain on three tools, two made of Florence B and one of Florence A. This pattern of raw material selection, differential thermal alteration of Florence A implying thermal pretreatment, and use of higher quality bedrock/residual cherts is identical to that observed for stemmed bifaces.

Table 3.17. Use inferences for stemmed bifaces.

Use Inferences	Number of Artifacts
Projectile point	6
Projectile Point/Light Duty Butchering	7
Projectile Point/Light Duty Butchering/Scraping	1
Light Duty Butchering	42
Light Duty Butchering/Scraping	6
Indeterminate	7

Table 3.18. Unstemmed bifaces: cross-tabulations of chert type, heat alteration, and mode of occurrence.

Chert Type	Bedrock/Residual		Indeterminate		Total
	Heated	Not Heated	Heated	Not Heated	
Florence A	6	1	41	3	51
Florence B	-	-	9	34	43
Flint Hills light gray	-	-	-	1	1
Total	6	1	49	39	95

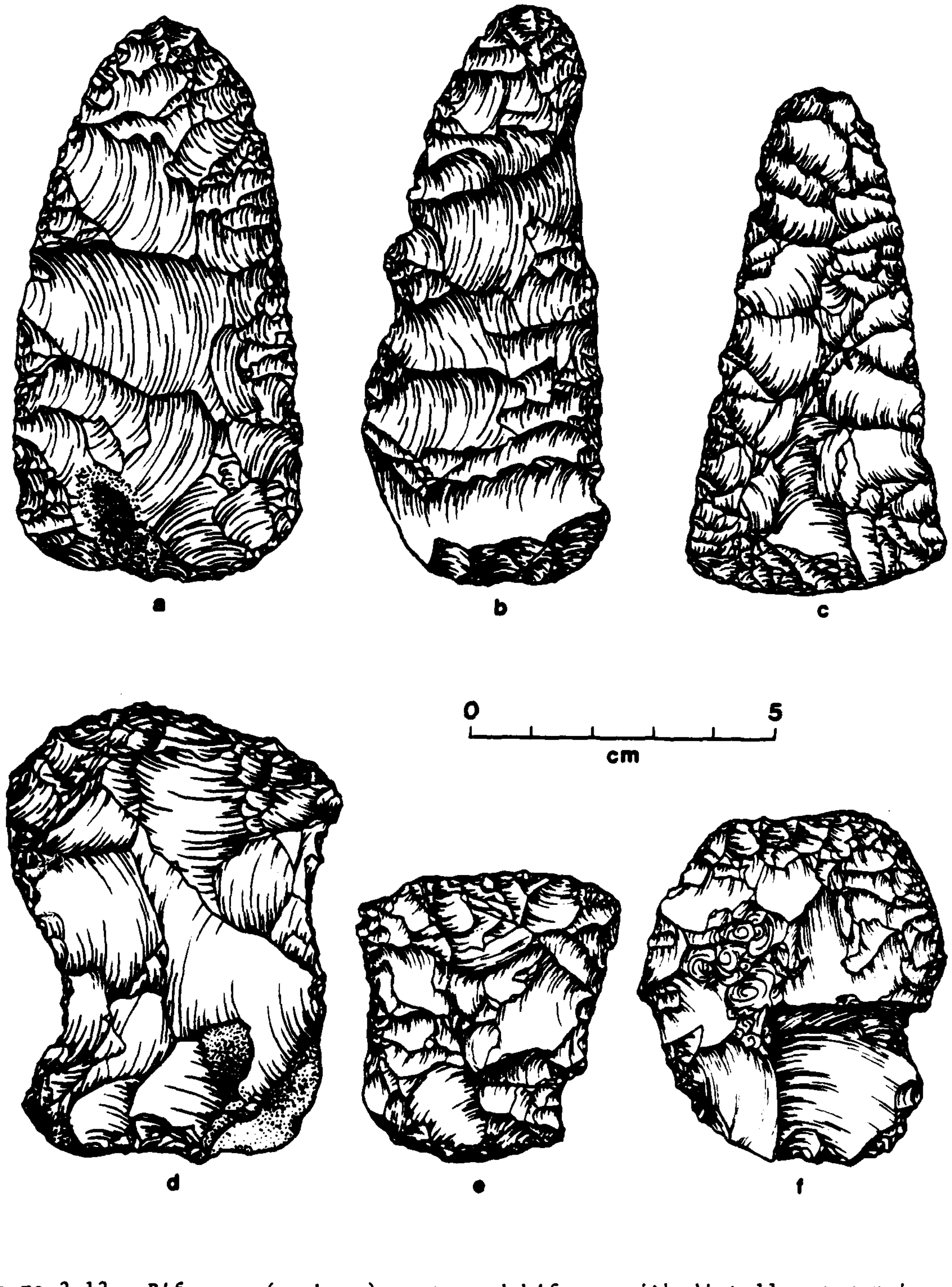

Figure 3.13. Bifaces: (a, b, c) unstemmed bifaces with distally converging lateral working edges (A4345, A4953, A4952); (d, e) bifaces with transverse working edges (FN1726, A4840); (f) ovate biface (A4382-2).

The basic difference between stemmed and unstemmed bifaces, excepting the stem, is size. Mean values for length, width, and thickness are all larger for unstemmed than for stemmed tools. The two groups are separated on a bivariate plot of maximum length versus maximum width; only one unstemmed biface falls within the range of variation exhibited by stemmed tools (Fig. 3.14). These relatively large tools were all probably hand held, indicated by the fact that wear is present around the entire perimeter of most tools.

Use, Breakage, Maintenance, and Modification: Tools show evidence of having been used in various scraping and cutting tasks of both hard and soft materials; a few tools are multifunctional. Only one tool exhibits heavy step flaking and blunting which is characteristic of working hard material, e.g., wood. It was used as a cutting and scraping tool; edges are uneven and cupped and wear is variously unifacial and bifacial. Three tools functioned as hide scrapers; working edges are plano-convex in cross section and exhibit heavy smoothing, polish, and edge perpendicular striations, all indicative of scraping hides (Semenov 1964; Ahler 1971, 1979; Wylie 1975). One of these tools was also used to cut soft substances. The most common edge damage pattern is that of bifacial smoothing and polishing in conjunction with slight edge blunting and/or step faceting. Smoothing and polish in the absence of flaking wear also occur on 12 tools. These edge damage patterns are consistent with an interpretation of light duty butchering and cutting of meat and other soft substances (Ahler 1971: 82-7). Four artifacts have no observable edge damage that is attributable to use. These bifaces are all broken and probably represent manufacturing rejects. Edge damage patterns are summarized in Appendix B, Table B.3. Inferences concerning use based on edge damage patterns are presented in Table 3.19.

Most recovered artifacts in this class are broken (85 of 95); excepting the aforementioned unused tools, it is hypothesized that these tools broke during use and/or resharpening. Ten transverse breaks are associated with heavy blows and two tools have been broken due to overshot flakes (Fig. 3.18a, b). In conjunction with worn edges, tool resharpening is indicated. Lateral snaps may have resulted from use or resharpening. Two tools have modified breaks in the form of smoothing and polish extending

Table 3.19. Use inferences for unstemmed bifaces.

Use Inferences	Number of Artifacts
Butchering/General Cutting	87
Woodworking	1
Hide Scraping	1
Hide Scraping/Cutting	2
Not Used	4

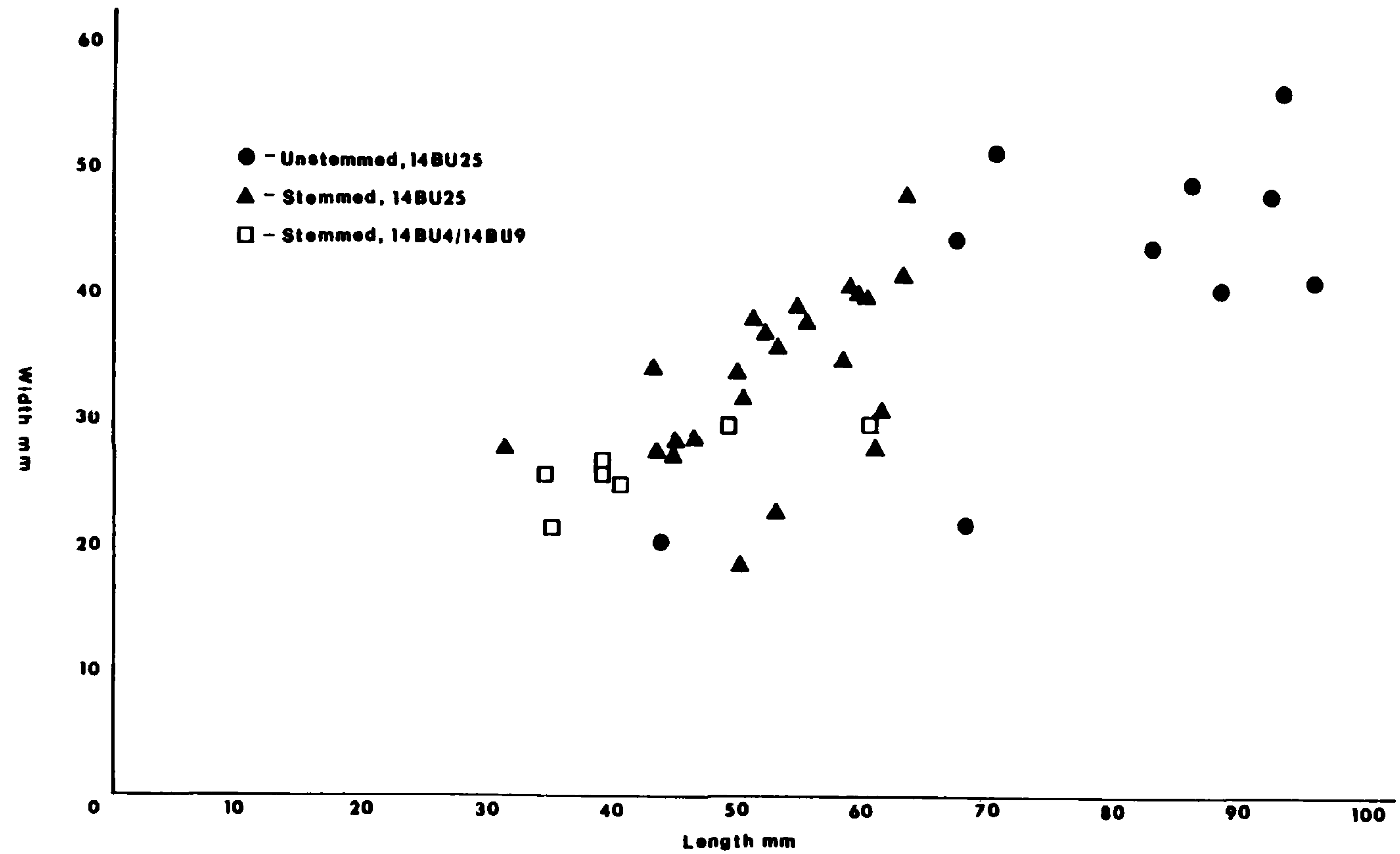

Figure 3.14. Scatterplot of maximum length and width for stemmed and unstemmed bifaces with distally converging lateral working edges from 14BU25 and stemmed bifaces from 14BU4 and 14BU9.

over fracture surfaces. Several tools also have negative flake scars which cross cut areas of heavy wear, but are themselves worn (e.g., Fig. 3.13b). Artifacts also have as many as three fracture surfaces. Tools were either fractured in several places by use or by errant resharpening blows at one time, which is unlikely, or were broken, then used and broken again. This pattern is similar to that described for stemmed tools; i.e., tools were extensively used, resharpened, broken, and sometimes utilized in broken states before final discard or loss.

Bifaces with Transverse Working Edges (n = 6)

This group of tools includes all invasively flaked specimens with working edges located transversely to the longitudinal axis. Three of these tools have lateral working edges, but these are separated from the distinct transverse working edge. Length, width, thickness, and weight measurements are presented in Appendix C, Table C.3. A scatterplot of length and width demonstrates that these tools fall into two groups on the basis of size: a relatively large group and a group of smaller artifacts (Fig. 3.15). This relationship is also evident in the distribution of weight values (see Table C.3).

The two massive bifaces are invasively flaked functional equivalents of marginally retouched cobbles. One was made from a bedrock/residual nodule, the other from a tabular stream cobble. Retouch on both specimens is limited to removal of large primary flakes which modified artifact faces and prepared the working edges. Both tools have biconvex working edges that are heavily blunted and step fractured. These edges have probably been used in heavy duty cutting and/or chopping tasks such as woodworking. On one tool (A44101), the edge opposite the primary working surface is plano-convex and exhibits pronounced unifacial smoothing and step flaking. This type of edge damage is characteristic of scraping wood, bone, or antler (Ranere 1975:192-3; Wylie 1975:3). The other tool also has a secondary working edge on the other transverse end. This edge is heavily battered and crushed, indicating hard percussion use (Ahler 1979).

The four smaller tools have also been used in heavy duty pounding, chopping, and scraping activities. One artifact has a plano-convex working edge (A4840, Fig. 3.13e). Unifacial smoothing and flaking wear are present on the dorsal surface of the bit. The tool has been used to scrape or plane resistant materials such as wood. This tool conforms closely in shape and function to "Clear Fork Artifacts" (Hester et al. 1973). Lateral and proximal edges are slightly smoothed and blunted, perhaps indicating edge dulling in preparation for hafting. Two tools (A44100, FN1726, Fig. 3.13d) have double beveled working edges with pronounced step flaking and smoothing damage. These tools have been extensively resharpened; numerous flakes end in step and hinge fractures creating a ridge which runs approximately parallel to the working edge. These tools were probably used to chop resistant materials (Wylie 1975). Both tools have constricted lateral margins which are heavily ground and/or crushed in preparation for hafting. The remaining tool in this group was manufactured from a tabloid of Florence A chert. The transverse and one lateral edge are heavily crushed and smoothed; it has been used as a percussing tool. This artifact

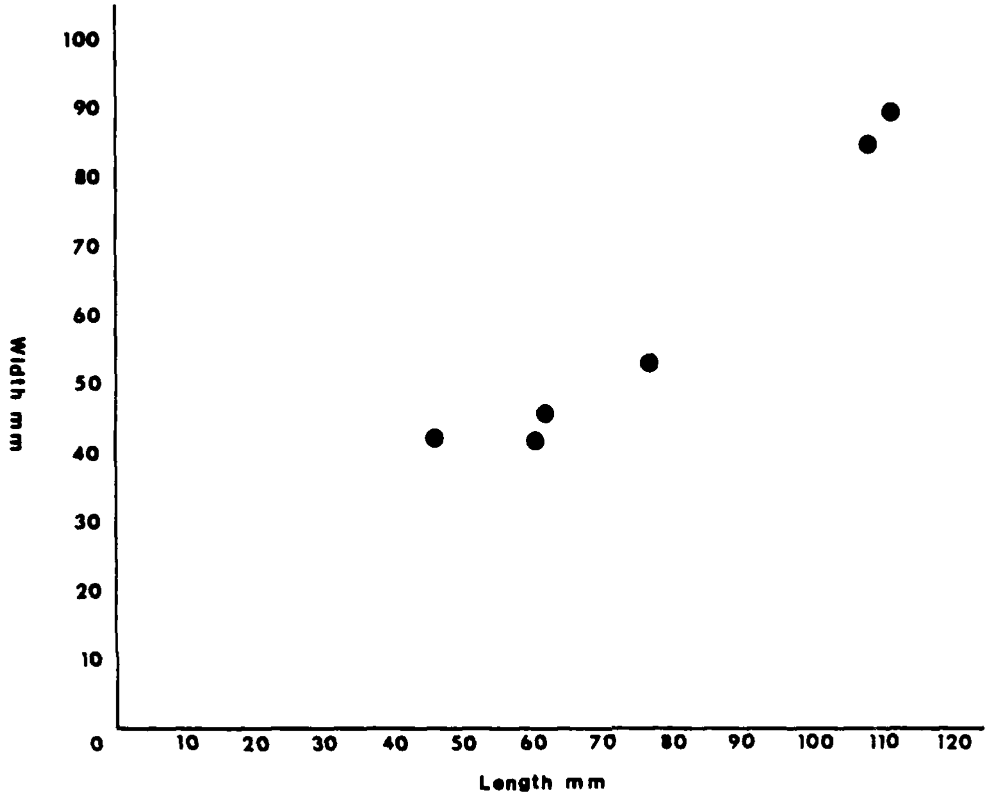

Figure 3.15 Scatterplot of maximum length and width for bifaces with transverse working edges.

is similar to the core hammerstones recovered from the Late Archaic Booth site (Klippel 1969:23-4) and Rodger's Shelter (Ahler and McMillan 1976: 183-5). Suggested functions include vegetable food processing tools, pecking tools used to shape groundstone artifacts, and chipped stone percussors. The absence of preformed groundstone tools at 14BU25 makes it unlikely that the tool was used to manufacture such objects, although it could have been used to roughen manos and metates. The working edge is smoothed in several places; therefore, it may have been used to process plant foods (cf. Klippel 1969:29).

Manufacture of transverse working edge tools was accomplished mainly by removal of decortication flakes from nodules and tabloids to form working edges. Three tools have working edges modified by removal of smaller flakes during optional primary trimming; these tools were hafted. There was no differential selection for bedrock/residual cherts or for Florence A chert, such as was documented for tools with lateral working edges. Thermal alteration was not part of the manufacturing trajectory (Table 3.20). The lack of precision flaking seems to have obviated the need for bedrock/residual cherts and thermal alteration. These tools were used predominantly for heavy duty tasks, e.g., chopping and scraping of wood and bone.

Ovate Bifaces (n = 29)

Ovate bifaces are circular to oval, invasively flaked artifacts with discontinuous working edges around tool perimeters (Fig. 3.13f). Eight complete and 21 fragmentary tools were recovered. Metric data for complete tools are presented in Appendix C, Table C.4.

Raw materials selected for manufacture into ovate bifaces were predominantly Florence A and B cherts; four pieces of light gray and one piece each of Cresswell and quartzite are present. The quartzite is unique in the Milbourn chipped stone assemblage. Quartzite does occasionally occur in the El Dorado area, and therefore, the piece is not necessarily exotic. Bedrock/residual and stream cherts were selected as raw materials. Traces of original blank surfaces indicate that tools were manufactured from flake blanks and directly from nodules. The proportion of thermally altered specimens is similar to that observed for bifaces with distally converging lateral working edges; Florence A chert is almost invariably heat altered (Table 3.21). Working edges have been variously

Table 3.20. Bifaces with transverse working edges: cross-tabulations of chert type and mode of occurrence.

Chert Type	Mode of Occurrence		
	Bedrock/Residual	Stream Deposit	Indeterminate
Florence A	1	-	-
Florence B	1	2	2

Table 3.21. Ovate bifaces: cross-tabulations of chert type, thermal alteration, and mode of occurrence.

Raw Material Type	Bedrock/Residual		Stream Deposit		Indeterminate		Total
	Heat	No Heat	Heat	No Heat	Heat	No Heat	
Florence A	-	1	-	-	6	-	7
Florence B	-	2	-	-	10	4	16
Flint Hills light gray	-	1	-	2	1	-	4
Cresswell	-	-	-	-	-	1	1
Quartzite	-	-	-	-	1	-	1
Total	0	4	0	2	18	5	29

shaped during initial reduction and optional primary trimming, as inferred from the presence of relatively large flake scars and uneven, sinuous edges, and even edges formed by small retouch scars, respectively.

These tools were variously used for scraping, cutting, and/or sawing hard objects. Tool edges are variously step fractured, blunted, smoothed, and polished, both unifacially and bifacially. One tool exhibits only bifacial smoothing and polish which implies cutting soft substances. Three other tools have unworn edges; all are broken. One tool was fractured by an overshot flake, the other two snapped transversely; these tools apparently broke during the final stages of manufacture and were, therefore, discarded without use (Appendix B, Table B.4). Tools are worn discontinuously around their entire margins, meaning that they were probably hand held. These tools are interpreted as, generally, being part of a woodworking tool kit.

Bifacial Preforms (n = 43)

Bifacial preforms are defined as bifaces with remnant striking platforms remaining along portions of their margins. Remnant platforms remaining from original flake blanks are, however, not included in this specification (cf. Reid 1978:120). There are nine complete and 34 broken preforms in the excavated sample from 14BU25. Measurements of complete artifacts are listed in Appendix C, Table C.5.

Manufacture: A wide variety of chert types are represented in the preform sample, although 65% are Florence A. Florence B and one specimen each of light gray, Flint Hills green, and Cresswell are present. These cherts were procured almost exclusively from bedrock/residual deposits; only 2 of 27 specimens of determinate source were derived from stream deposits (Table 3.22). This pattern of chert procurement, i.e., Florence A from bedrock/residual sources predominating, is most similar to that of bifaces with distally converging lateral working edges.

Table 3.22. Cross-tabulations of chert type, mode of occurrence, and thermal alteration for bifacial preforms.

Chert Type	Bedrock/Residual		Stream Deposit		Indeterminate		Total
	Heat	No Heat	Heat	No Heat	Heat	No Heat	
Florence A	15	7	-	-	4	2	28
Florence B	1	1	-	1	4	5	12
Flint Hill light gray	-	-	-	1	-	-	1
Flint Hills green	1	-	-	-	-	-	1
Cresswell	-	-	-	-	1	-	1
Total	17	8	0	2	9	7	43

Bifacial preforms were manufactured from flake blanks and directly from nodules of raw material. Two flake, seven tabular flake, and four nodule blank types are determinate. Support for this conclusion is found in the fact that flake blank ventral surfaces, nodule exteriors, and tabloid surfaces remain on these specimens. Preforms are both thermally altered and not altered. Florence A chert has been thermally altered more than Florence B. similar to the pattern documented for other tool classes. However, the incidence of heating is lower (19 of 28 tools) among preforms than among bifaces with distally converging lateral working edges and ovate bifaces. This is probably indicative of the position of preforms in the manufacturing sequence, i.e., they have been shaped only by primary trimming or partially shaped by secondary trimming. Optional thermal pretreatment apparently occurred at any time in the reduction sequence from the end of initial reduction to preform completion, that is, when no remnant platforms remained on tool margins. Several preforms have heavily ground platforms. Grinding is distinguished from smoothing wear in that the former results in a matte surface that is uniformly rounded; small step flakes from prior trimming flake removals are uniformly rounded or obliterated. In several instances subsequent flaking cross cuts grinding; the boundary between ground and unground edges is distinct. Some platforms have also been faceted by removal of small flakes from artifact margins, resulting in a beveled edge.

Use, Breakage, and Maintenance: All nine complete and 22 of 34 broken preforms have evidence of utilization; nine preforms are unused and three are so fragmentary as to be indeterminate. Utilization of these artifacts indicates that most are not manufacturing rejects. Most preforms were probably used to cut or saw wood. This inference is based on moderate to heavy flaking, blunting, and smoothing wear, relatively thick tool cross sections resulting in large edge angles, and predominantly uneven, wavy working edges. These are all common characteristics of woodworking tools (Tringham et al. 1974; Wylie 1975; Wilmsen 1970:70;

Sollberger 1968:97-8). Two tools were used to scrape wood or bone and two were used to cut and scrape these materials. Edges of these tools are damaged unifacially and variously unifacially and bifacially. Four tools exhibit only smoothing and polish; in conjunction with thin, even working edges, use as light duty cutting tools is indicated. Edge damage patterns are summarized in Appendix B, Table B.5 and use inferences in Table 3.23.

Nine broken preforms exhibit no edge damage other than small step flakes which resulted from manufacture and platform grinding. These artifacts are manufacturing rejects. All artifacts have broken due to lateral snap; one also has a break with conchoidal fracture characteristics indicating failure due to a misdirected blow. Two cross mended fragments exhibit multiple breaks; the fracture surface on one piece has been reworked, but flake scars end in a series of compound step terminations. Apparently, the artifact broke during manufacture, an unsuccessful attempt was made to rework the piece at which time it broke again, and the fractured pieces were discarded. Several utilized specimens exhibit fractures with conchoidal features and/or direct association with large, deep negative flake scars on artifact faces. These tools broke during resharpening or reworking procedures. Two cross mended fragments are fractured at the point of impact where a large flake was detached from a remnant platform, presumably the cause of failure. This tool was used, then an attempt at further reduction was made by way of removal of a large platform along the lateral edge. An errant blow resulted in breakage. The fracture surface of one piece was then minimally retouched, but no signs of utilization were observed. Analysis of preforms indicates a pattern of use, resharpening, reworking, and reuse. Few tools are rejects in the sense that they were broken and/or discarded before use.

Although most preforms are not manufacturing rejects, it is possible that they represent a class of tools which were systematically modified into other forms by secondary trimming and shaping processes. It is not necessarily productive to ask "were these tools intended to be manufactured into other forms?"; the sample of preforms recovered obviously were not so modified, but used as they were. However, it is relevant to ask "were these tools members of an artifact class whose members were sometimes modified into other forms?" In other words, do "preforms" recovered from the Milbour- site represent an earlier technological stage of

Table 3.23. Use inferences for bifacial preforms.

Use Inferences	Number of Artifacts
Cutting and sawing wood or bone	22
Light duty cutting/butchering	4
Scraping wood or bone	2
Cutting and scraping wood or bone	2
Not Used	9
Indeterminate	3

some other class or classes of artifacts? Based on general artifact morphology and raw material procurement patterns, it is hypothesized that preforms represent a technological stage prior to finished tools with distally converging lateral working edges.

To test this hypothesis, several implications are induced. If the hypothesis is true, then both artifact classes should be made from the same chert types and chert should be derived from similar source locations. Preforms, by virtue of representing an earlier technological stage, should be larger, but similar in shape to tools with distally converging working edges. A chi square test of independence indicates that no significant difference exists in the proportions of Florence A and Florence B between artifact groups (Appendix A, Table A.9). A Fisher's exact test (used because of low theoretically expected cell values) demonstrates that no significant difference exists in the proportion of chert from bedrock/residual and stream deposits between the two classes (Table A.10). Scatter plots of length versus width, and width versus thickness show that preforms are generally larger in all dimensions than finished tools and that plan view and cross-sectional shapes are roughly similar (Figs. 3.16 and 3.17). There is no evidence which leads to a rejection of the hypothesis that preforms represent a technological stage which precedes that represented by bifaces with distally converging lateral working edges in the manufacturing trajectory.

Indeterminate Biface Fragments (n = 101)

This group of tools consists of small fragments which do not exhibit the necessary and sufficient conditions for inclusion in any of the previously defined biface classes. These fragments are probably related to all classes of bifaces. Patterns of raw material procurement and thermal alteration support this conclusion (Table 3.24). Florence B chert is represented most often followed by Florence A; Flint Hills light gray, Cresswell, and miscellaneous cherts are also represented. The predominance of Florence B mirrors the pattern described for ovate and transverse working edged tools, but is opposite that of preforms and tools with distally converging lateral working edges. However, the virtual absence of chert from stream deposits matches the pattern of these latter tool classes. High incidence of thermally altered Florence A (93%) is the same as all classes but preforms and tools with transverse working edges.

Working edges on fragments exhibit various combinations of bifacial flaking wear, blunting, smoothing, and polish. Tools were most often used as cutting implements on both resistant and yielding materials. Two tools are worn unifacially; both exhibit the characteristics of scraping hard materials. Ten fragments had no signs of use; the tools may have been broken during manufacture or the fragments may simply represent unused tool elements. Breaks are predominantly lateral snaps, although thermoclastic fractures, edge collapse, and overshot flakes are included.

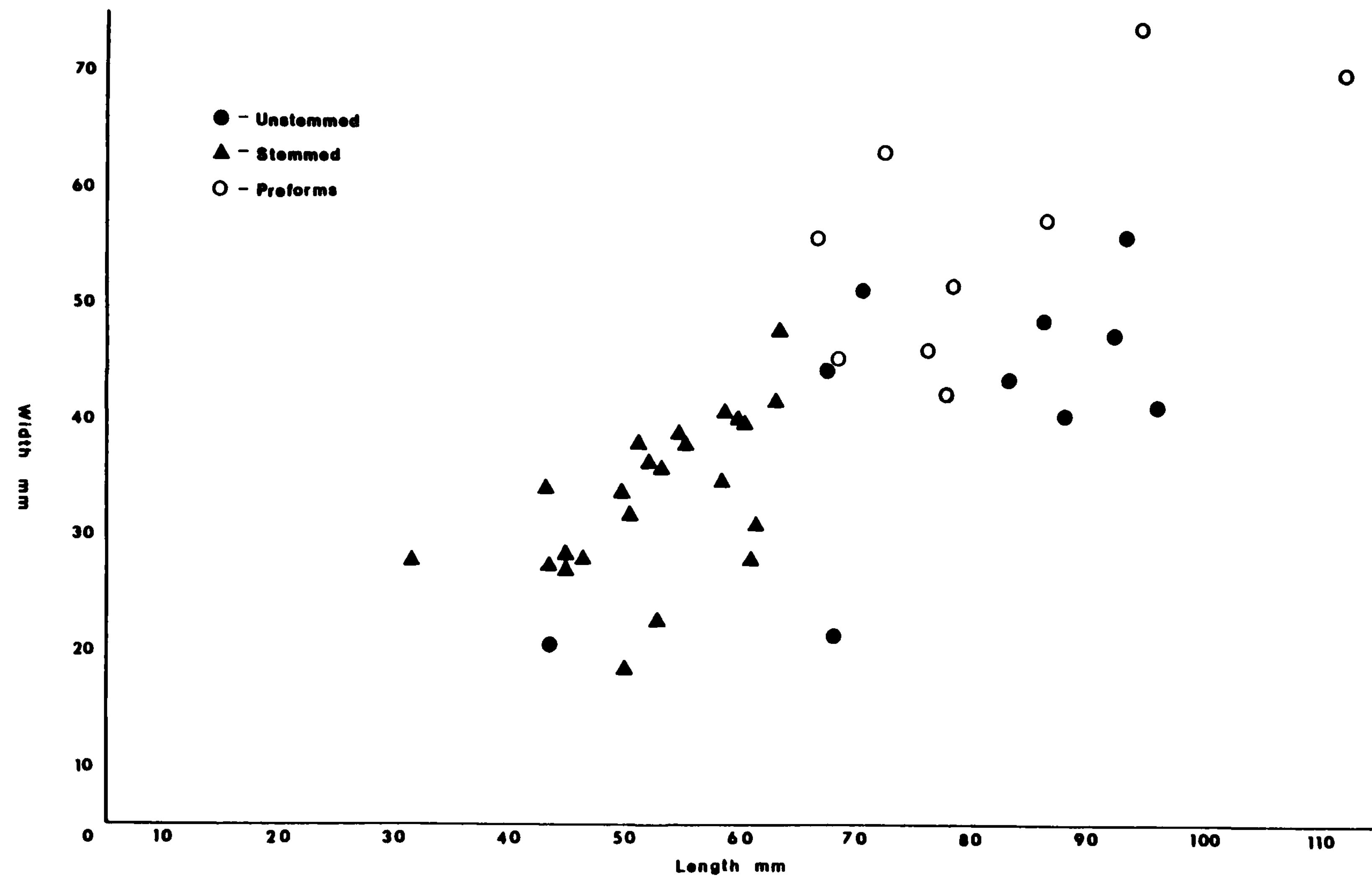

Figure 3.16. Scatterplot of maximum length and width for bifacial preforms and stemmed and unstemmed bifaces with distally converging lateral working edges.

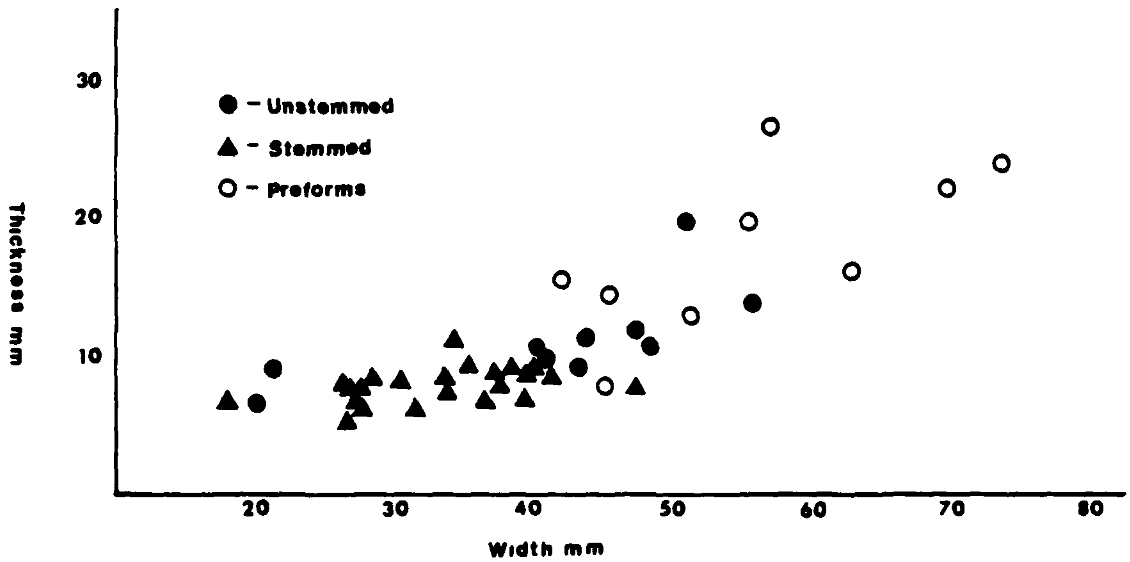

Figure 3.17. Scatterplot of width and thickness for bifacial preforms and bifaces with distally converging lateral working edges.

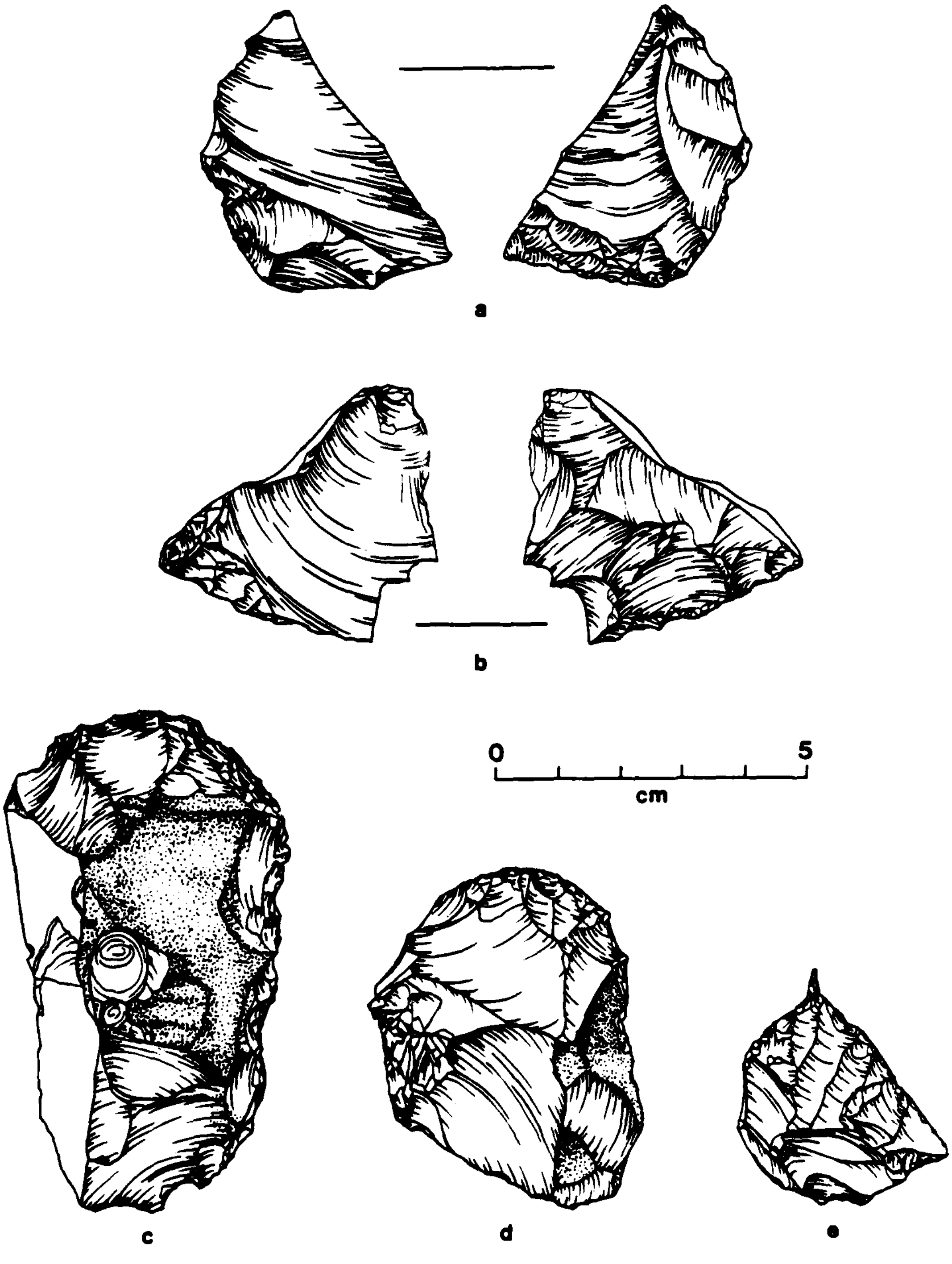

Figure 3.18. Chipped stone tools: (a, b) overshot flakes (A16446, A37461-1); c, d, e) marginally retouched flakes (A44068, A4946, A4962).

Table 3.24. Indeterminate biface fragments: cross-tabulations of chert types, mode of occurrence, and thermal alteration.

Chert Type	Bedrock/Residual		Stream Deposit		Indeterminate		Total
	Heat	No Heat	Heat	No Heat	Heat	No Heat	
Florence A	10	-	-	-	31	3	44
Florence B	1	2	-	1	14	33	51
Flint Hills light gray	1	-	-	-	2	-	3
Cresswell	-	-	-	-	1	-	1
Miscellaneous	-	-	-	-	-	1	1
Indeterminate	-	-	-	-	-	1	1
Total	12	2	0	1	48	38	101

Bifacial Marginally Retouched Nodules and Tabloids (n = 13)

Marginally retouched nodules and tabloids are defined as pieces of raw material that have a bifacially retouched working edge, but that have unmodified or incompletely flaked faces (cf. Reid 1978:136). Working edges are recognized by the presence of systematic and continuous edge modification. Nominal attributes recorded for these tools are raw material, blank type (nodule or tabloid), presence or absence of thermal alteration, and mode of occurrence (bedrock,residual, or stream deposit). Ratio data are length (measured perpendicular to the major working edge), width and thickness (maximum dimensions orthogonal to length and to each other), and weight.

These tools represent one of the manufacturing trajectories present at 14BU25. Large river cobbles, residual nodules and bedrock/residual tabloids were made into heavy duty chopping, cutting, and scraping tools. This was accomplished by detaching a series of flakes from around part or all of a cobble's or tabloid's perimeter. All specimens on which the flaking sequence could be determined had flakes removed from one side first; the piece was then turned over and flakes were detached from the opposite face (Fig. 3.19a, b). The exact flaking sequence on several specimens is obscured by heavy edge damage. Florence A, Florence B, and Flint Hills light gray cherts were all used to manufacture these tools, but most specimens are Florence B (Table 3.25). One piece of Florence A residual chert was used; frost pitting indicates a residual source location (Fig. 3.19b). None of these tools show signs of thermal alteration.

These tools are inferred to have been used in heavy scraping, cutting and chopping activities, such as woodworking or possibly heavy butchering of large mammals. Specimens are large; mean weight is 239.8 gm. and mean length is 88 mm. (see Appendix C, Table C.6 for metric data). Working edges exhibit varying combinations of crushing, blunting, smoothing, step

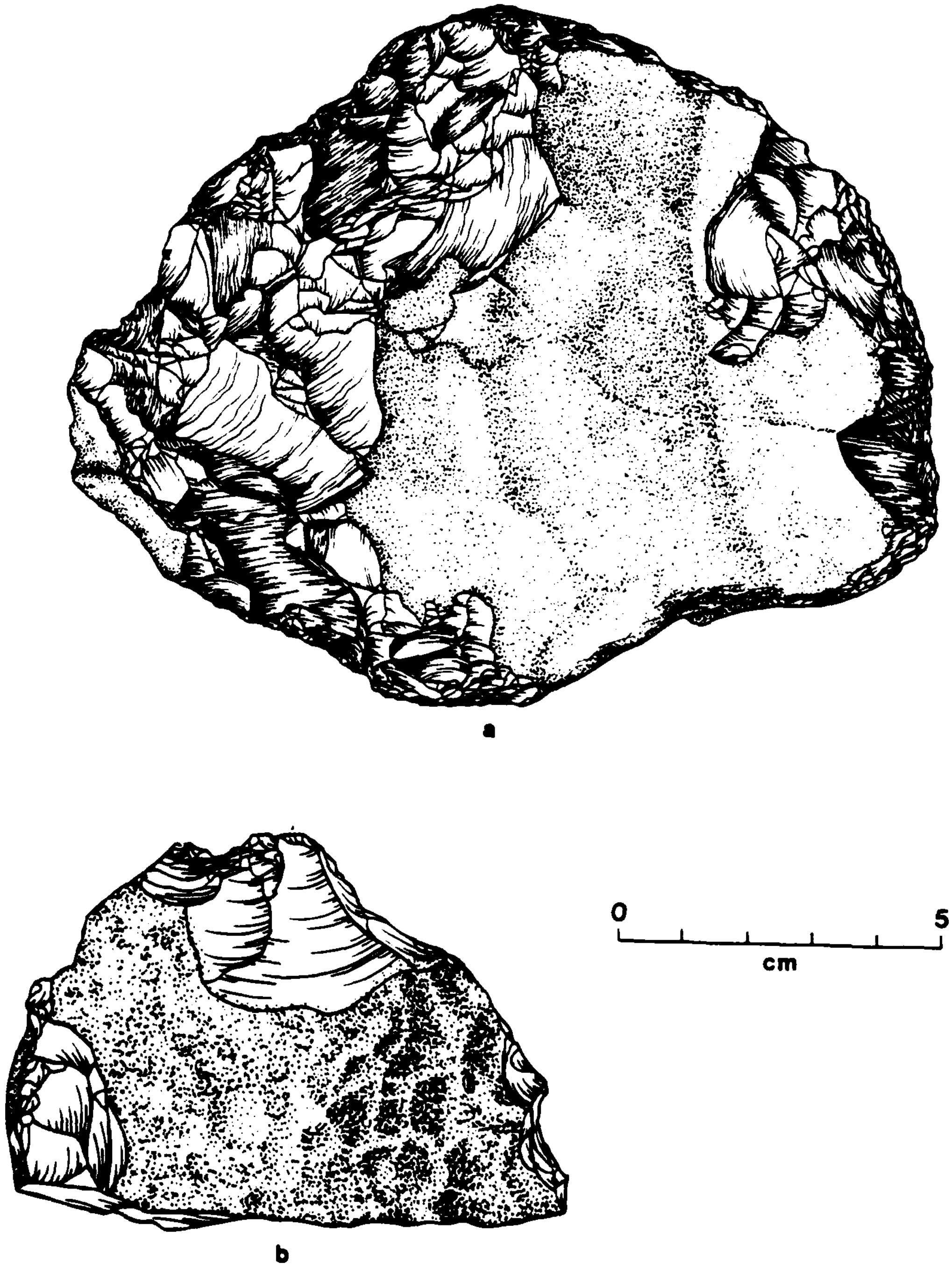

Figure 3.19. Marginally retouched nodules and tabloids: (a) A44095; (b) FN1733.

Table 3.25. Marginally retouched nodules and tabloids; cross-tabulations of raw material, mode of occurrence, and blank type.

Chert Type	Bedrock/Residual		Residual		Stream	
	Nodule	Tabloid	Nodule	Tabloid	Nodule	Tabloid
Florence A	-	-	1	-	-	-
Florence B	-	4	-	-	6	-
Flint Hills light gray	-	-	-	-	2	-

fracturing, and hinge fracturing; edge damage on most specimens is pronounced. Six tools have been resharpened as indicated by retouch scars which cross cut edge damage and/or a series of retouch scars which end in compound step fractures giving the working edge an undercut appearance.

Marginally Retouched Flakes (n = 52)

Marginally retouched flakes exhibit the same significata as do complete and broken flakes and have, in addition, a working edge that was prepared by retouch restricted to the flake edge (cf. White 1963:9). Fifty-two marginally retouched flakes were recovered; all are unifacially retouched (Fig. 3.18c, d, e). Analysis of these flake tools explores two questions: (1) what were the selection criteria for retouched flakes, and (2) what were these tools used for?

Marginally retouched flakes are coded for the same ratio and nominal scaled measurements as are unutilized flakes. In addition, the largest linear dimension in any plane is recorded to the nearest 0.1 mm. Edge damage and working edge shape are recorded in the same manner as for utilized, unretouched flakes.

Only 16 complete tools were recovered; these are compared metrically with the complete flake sample to determine selection criteria. As with utilized flakes, size was a factor in blank selection. Mean values of length, width, and thickness of marginally retouched pieces are larger than those of unretouched, complete flakes (Table 3.26). Examination of range of flake dimensions indicates that neither the smallest nor the largest flakes were selected, suggesting both an upper and lower limit on suitable blank size.

It was previously postulated that selection of flake blanks for utilization was not based on chert type, presence or absence of cortex or patina, or presence or absence of thermal alteration. Cross-tabulations of chert type, cortical state, and thermal alteration for marginally retouched flakes are presented in Table 3.27. Chi square tests are used to evaluate the significance of these attributes in blank selection for retouched pieces. Chert types and cortical states are not significantly

Table 3.26. Marginally retouched and complete flake dimensions.

Dimension	Marginally Retouched Flakes	Complete Flakes
Length	$\bar{X}$=56.7 mm.; s=10.5; n=16 Range: 43.5-80.9 mm.	$\bar{X}$=23.4 mm.; s=12.7; n=1601 Range: 519-109.7 mm.
Width	$\bar{X}$=46.6 mm.; s=8.7; n=16 Range: 31.2-61.5 mm.	$\bar{X}$=20.2 mm.; s=10.4; n=1601 Range: 0.9-73.3 mm.
Thickness	$\bar{X}$=11.8 mm.; s=5.5; n=16 Range: 5.0-25.6 mm.	$\bar{X}$=3.8 mm.; s=2.7; n=1601 Range: 0.5-27.7 mm.

Table 3.27. Marginally retouched flakes: cross-tabulations of chert type, cortical state and thermal alteration.

Chert Type	Cortex		No Cortex		Total
	Heated	Not Heated	Heated	Not Heated	
Florence A	2	2	6	14	24
Florence B	-	5	2	16	23
Flint Hills light gray	-	2	-	1	3
Flint Hills green	-	-	-	1	1
Cresswell	-	-	-	1	1
Total	2	9	8	33	52

associated with either unutilized or marginally retouched flakes (Appendix A, Table A.11, A.12). It is inferred from these results that these attributes did not play a role in blank selection. However, heat treatment is associated with nonutilized specimens (Table A.13). The proportion of unheated, marginally retouched flakes is greater than that of nonutilized specimens. Therefore, it is inferred that unheated flakes were purposefully selected for retouch. In summary, there was a tendency for relatively large, unheated flakes to be marginally retouched.

The analytical framework used to investigate tool use is identical to that employed for utilized flakes. However, retouched tools may exhibit edge damage that results from manufacture, not use. For example, edge retouching can result in slight step fracturing at the point of flake removal. Flaking wear which results from utilization will exhibit differential facet rounding due to continued use; flakes removed early in use will be more rounded than those removed at the end.

Scraping hard and soft objects, cutting hard and soft materials, and boring resistant material are the inferred uses of marginally retouched flakes (Table 3.28). Twenty-nine tools were used to scrape hard materials such as wood, antler, and bone. These tools exhibit unifacial smoothing and heavy step flaking in conjunction with various combinations of hinge, snap, and irregular flaking wear and occasionally polish. Scraping soft, pliable materials such as animal hides rarely produces heavy step flaking (Ahler 1979:320-2). The presence of smoothing that occurs predominantly unifacially with the absence of pronounced step flaking is evidence of scraping soft substances; 17 such specimens are present. Working edges are often polished and occasionally exhibit step fracturing. Several tools have edge perpendicular striations highly suggestive of use motion perpendicular to the working edge, i.e., scraping. Cutting or bidirectional scraping is indicated by bifacial edge damage. Two specimens are inferred to have been used to cut soft materials. One has snap flaking and edge smoothing; the other, hinge and snap flaking and smoothing. Two tools were probably used to cut hard objects. One is smoothed and has step and hinge flaking; the other is similar, but is also blunted. Two tools have pointed working ends. One has a trihedral working end which is heavily smoothed and polished; step facets occur on all three faces and originate from two directions indicating bidirectional motion. This tool probably functioned as a drill which was used to bore holes in wood, bone, antler, or some other hard substance. The other tool has a finely chipped, thin point; no edge damage was observed. The tool might be unused, or alternatively, it may have been used in light duty perforating tasks (Fig. 3.18e).

Table 3.28. Use inference for marginally retouched flakes.

Use Inference	Working Edge Plan Shape					
	Straight	Convex	Concave	Pointed	Irregular	Total
Hard Scraping	2	19	2	-	6	29
Soft Scraping	1	16	-	-	-	17
Hard Cutting	1	1	-	-	-	2
Soft Cutting	1	1	-	-	-	2
Boring	-	-	-	1	-	1
Indeterminate	-	-	-	1	-	1
Total	5	37	2	2	6	52

Cores and Core Fragments (n = 25)

Cores are defined as pieces of chipped stone that exhibit the following significata: (1) one or more striking platforms, (2) one or more cleavage faces (flake removal surfaces), and (3) more than one flake scar. Core fragments are pieces of broken cores which may or may not exhibit all of the above significata. They will exhibit at least one of them and in addition have one or more broken surfaces that do not possess the features of a flake ventral surface (bulb of force, eraillure, or ripples).

A series of nominal, ordinal, and ratio data are recorded for each core and a series of nominal and ratio data are recorded for every complete negative flake scar on core faces. Nominal data recorded for each core and core fragment are raw material type, presence or absence of use modification, mode of occurrence (bedrock, residual, or stream deposit), presence or absence of heat alteration, and precore raw material form (tabloid, nodule, tabular flake, or flake). Ordinal scale data include number of striking platforms and number of complete flake scars present. All cores are weighed to the nearest 0.1 gm. for every complete negative flake scar, striking platform state is noted (see Flakes, for striking platform states) and flake scar width and length are measured to the nearest 0.1 mm. in a manner analogous to those measurements on complete flakes. Core angle is the angle formed between the striking platform and the negative flake scar surface; this measure is directly comparable to flake angle. Core angle is recorded to the nearest degree with the aid of a contour gauge and goniometer for every complete flake scar. This measure is subject to the same inaccuracies stated for flake angle. Descriptive statistics for core angle, flake scar length, and flake scar width are given in Table 3.29.

Several kinds of cores can be defined on the basis of shape and the number and orientation of striking platforms in relation to each other (cf. Montet-White 1973:67). Those recovered from 14BU25 are as follows. Discoidal cores have two circular or ovoid cleavage faces which intersect at the core's midline. Each cleavage face is the striking platform for flakes removed from the opposite face (Fig. 3.20b). Polymorphic cores have flakes removed in an unpatterned manner in several directions; each detached spall may have its own platform. These cores are amorphous in overall shape. Tabular cores are rectangular blocks of raw material from

Table 3.29. Descriptive statistics for core angle, and flake scar length and width.

	$\bar{X}$	s	n
Core Angle	70.9°	14.7	53
Core Flake Scar Length	30.4 mm.	11.2	53
Core Flake Scar Width	31.4 mm.	11.7	53

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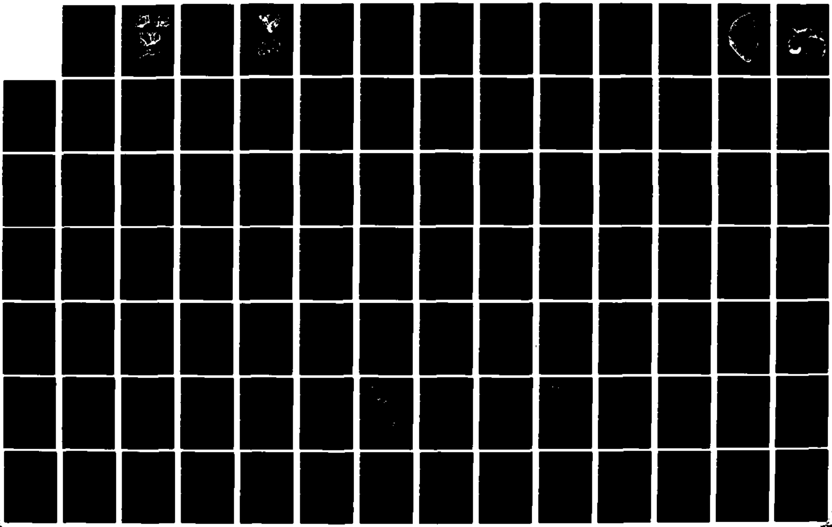

1.0 1.1 1.25 1.4 1.6 1.8 2.0 2.2 2.5 2.8 3.2 3.6 4.0 4.5 5.0 5.6 6.3

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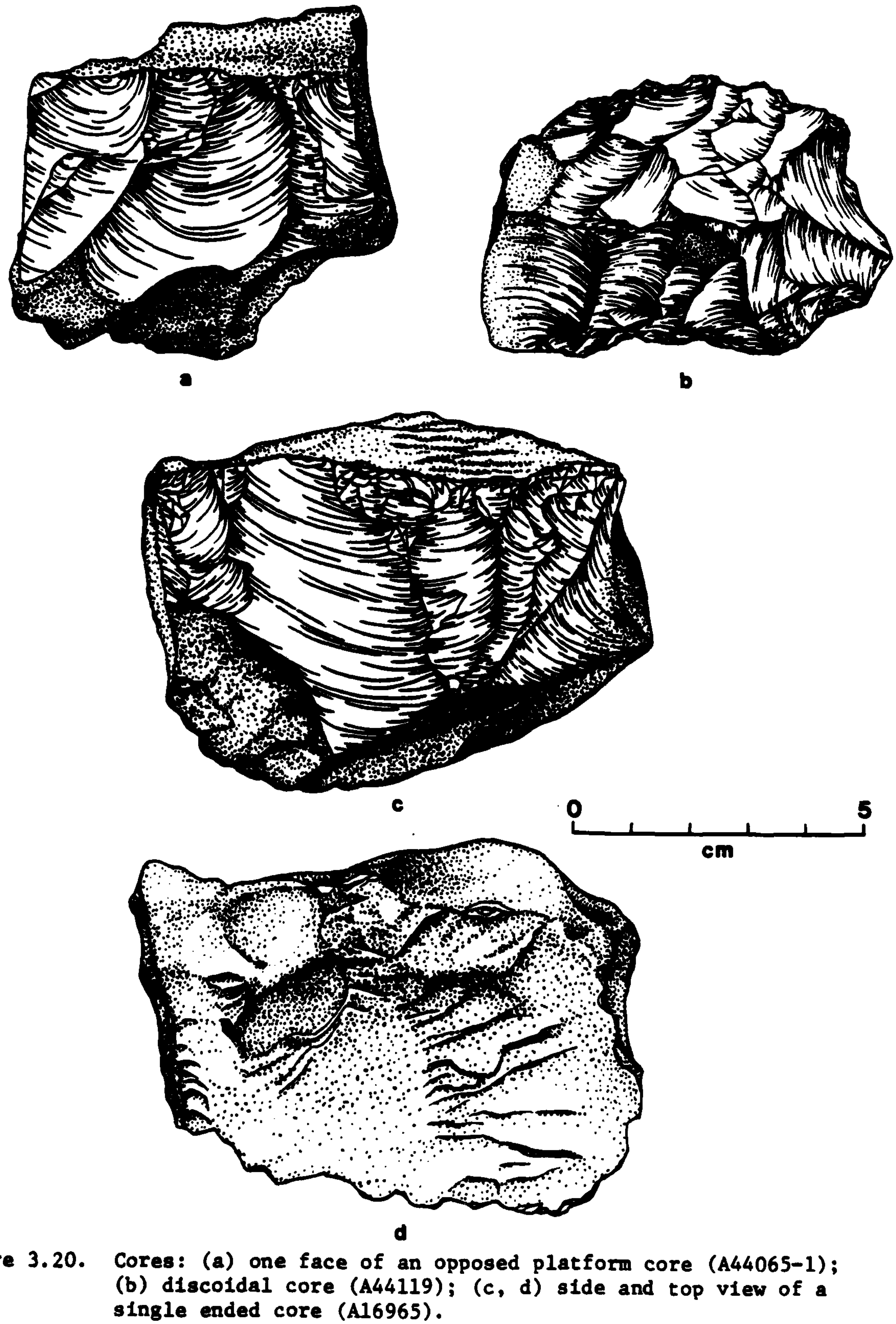

Figure 3.20. Cores: (a) one face of an opposed platform core (A44065-1); (b) discoidal core (A44119); (c, d) side and top view of a single ended core (A16965).

which tabular flakes were detached. Single ended cores have only one striking platform, such that flakes were struck off in only one direction (Fig. 3.20c, d). Opposed platform cores have only two striking platforms situated at approximately 90° or 180° angles to each other; flakes may be detached from the same or different cleavage faces (Figs. 3.20a, 3.21) (cf. White 1963:6-7; Montet-White 1973:67; Leaf 1979b:96-8).

The above core types are made from Florence A, Florence B, and Flint Hills light gray cherts which were quarried and/or collected from bedrock/residual and stream deposits (Table 3.30). Only two cores are thermally altered, both Florence A fragments. All core types, with the exception of tabular cores, were manufactured with Florence B chert. Florence A occurs only as discoidal, a single tabular core, and core fragments. Two opposed platform cores are made of light gray chert and are the only cores of this chert type. The sample is small and absence of certain core types among certain chert types may reflect only sample size deficiencies. Most cores were manufactured from nodular pieces of raw material; among determinate specimens, 12 are nodules and four are tabloids. One polymorphic core has a utilized edge; it exhibits pronounced bifacial smoothing and step faceting. The core was probably used as a woodworking tool.

Cores are in general large; average weight is 193.6 gm. with individual measurements ranging from 41.1 to 596.1 gm. However, the different core types range considerably in size. Although sample sizes are small, certain trends appear to be present. Discoidal cores are the smallest kind, followed by polymorphic, then opposed platform cores. Only a single example of both tabular and single ended cores are present, so they are not considered here (Table 3.31). Differences in core sizes may be due to variation in initial raw material size and/or variation in the amount of reduction different core types underwent. The lack of any original raw material surface (patina or cortex) on all but one discoidal core and its presence on all opposed platform cores suggests that differential reduction is at least partially responsible.

Table 3.30. Cores: cross-tabulations of chert type and mode of occurrence.

Chert Type	Mode of Occurrence		
	Bedrock/Residual	Stream Cobble	Indeterminate
Florence A	4	-	3
Florence B	4	9	3
Flint Hills light gray	-	2	-
Total	8	11	6

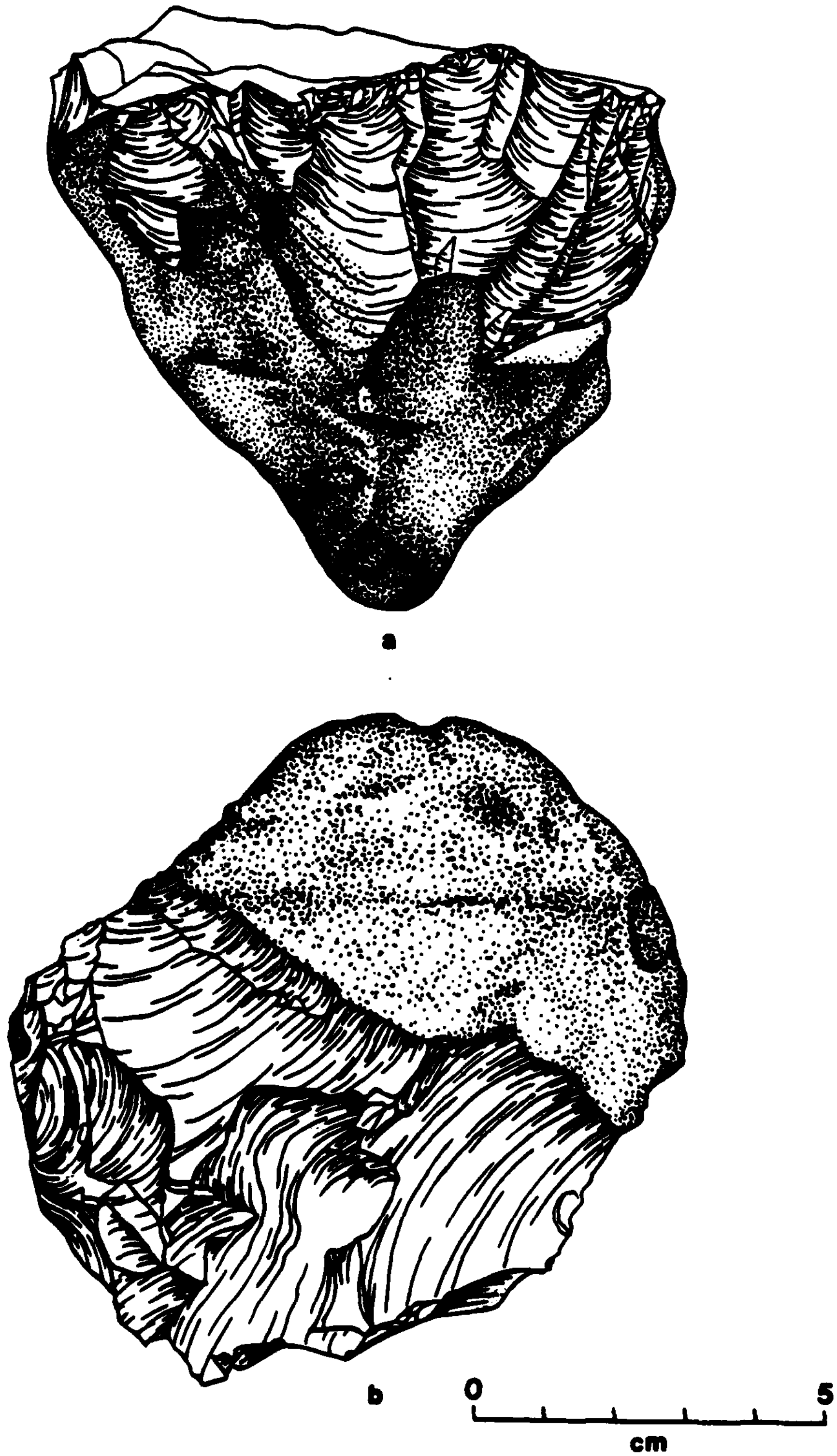

Figure 3.21. Opposed platform core (A4752): (a) side view; (b) top view.

Table 3.31 Descriptive statistics for core types.

Core Type (n)	$\overline{X}$ (gm)	s	Range
Discoidal (5)	93.9	46.4	41.1-150.9 gm
Tabular (1)	65.1	-	-
Polymorphic (5)	162.1	64.6	112.3-274.9 gm
Opposed Platform (6)	292.0	205.9	161.6-596.1 gm
Single Ended (1)	387.5	-	-
All Cores (18)	193.6	154.2	41.1-596.1 gm

Different core types were produced by varying the sequence of flake detachment and by differential selection and/or preparation of striking platforms. Discoidal cores were produced by striking flakes from around the perimeter of a piece of raw material, the piece was then turned over and the process was repeated. The sequence was usually repeated more than once. These manufacturing steps resulted in the production of circular to ovoid artifacts with uneven, cupped edges. Many of the last flakes removed from these cores are small and terminate in step fractures; this may have been what led to abandonment of the cores (Fig. 20b). Striking platforms at complete flake scar origins are cortical (2), plain (7), and faceted (10). It appears that flakes were detached from cores most often where two negative flake scars intersect; experimentally this has proven to be an advantageous spot for the application of force (Collins 1974:164).

Polymorphic cores were manufactured from pieces of raw material that exhibit naturally flat surfaces. Flakes were first detached using these flat areas as striking platforms. Subsequent flake removal progressed by using core cleavage faces as platforms, selection of which resulted in unpatterned flake removals. Striking platforms associated with complete flake scars are patinated (5), plain (4), and faceted (4). The higher incidence of unprepared platforms and lower number of facated platforms compared with discoidal cores reflects the different processes of blank detachment.

The only tabular core recovered was produced by detaching tabular flakes from the end of a block of bedrock raw material. The final blank which was struck did not continue down the cleavage face, but hinged out. The core has no platform area left, it has been reduced to a ridge. The only member of the single ended core class is a stream cobble with one naturally flat surface, which served as as unprepared striking platform.

Blanks were detached from only one cleavage face (Fig. 20 c, d).

Opposed platform cores are similar to single ended cores, but have been turned during blank removal such that flakes were detached from platforms which are situated approximately at 90° to 180° angles vis-a-vis each other (Fig. 20a, 21). Several permutations of core rotation were carried out. One specimen has 90° opposed platforms such that flakes were detached from the same cleavage face. All other cores in this class have two cleavage faces; one of these has had blanks removed from the same face at a 180° opposition (Fig. 21). Natural flat surfaces and cleavage faces were used as platforms. This resulted in both unprepared patinated (6) and plain (4) striking platforms which are associated with complete negative flake scars. All of these cores were manufactured on alluvial cobbles.

The main quesion addressed in this core analysis is: what were flakes struck from cores used for? Flakes detached from cores may be further modified into various tool forms, utilized without modification, or not used for anything at all. Towards this end flake length, width, and flake angle data for utilized flake and marginally retouched flake samples are compared with corresponding measures of complete negative flake scars on cores. Counts of raw material types and modes of occurrence are also compared between core, utilized flake, and marginally retouched flake samples. Although both flake tool classes are similar in most qualitative aspects, significant differences in size are present. Therefore, these tool classes are treated separately in the following comparisons.

Quite obviously, flake tools must be derived from some larger piece of chert. It is certainly reasonable to hypothesize that they were derived from core classes represented on the site. If flake tool blanks were struck only from cores, as opposed to being derived from other manufacturing sequences such as biface manufacture, several relationships between flakes and cores should be evident. Cores and flake tools should be derived from the same sources, i.e., stream, residual, and/or bedrock deposits. Raw material frequencies among samples of different artifact classes should be similar. Another implication is that size distributions are similar between flake tools and detachment scars on cores. However, only complete scars on cores are amenable to measurement. Since these give evidence of only the later flakes removed from cores, negative core flake scars may be smaller than many flake tools. Thus, interpretations of comparisions must be made cautiously. Flake and core angles should also be similar, but the same biases mentioned above may well be present. The above implications assume core and flake tools are a representative sample of all cores and flake tools which participated in the lithic manufacturing system at the Milbourn site.

Raw material frequencies are not significantly different between core, utilized blank, or marginally retouched flake classes. There is no difference between cores and utilized flakes in the amount of raw materials derived from bedrock/residual or stream deposits. However, a significantly higher proportion of marginally retouched flakes than cores

was derived from bedrock/residual deposits. These conclusions are based on chi square tests which are summarized in Appendix A, Tables A.14 and A.15.

The relationship between flake length and width for flake tool and core samples is displayed graphically in Figure 22. Core flake scars are, in general, smaller than flake tools. No flake tool is less than 2 cm long, yet 13 core flake scars are less than 2 cm in length. The longest core flake scar is 5.6 cm; 15 flake tools are longer than 5.7 cm. Both marginally retouched and utilized flakes are significantly longer than core flake scars; retouched flakes are also significantly wider. There is no difference between core angle and marginally retouched flake angle means. However, core angle and utilized flake angle means are significantly different. The t tests are summarized in Tables A.16 and A.17. Thus, significant differences are present between length and angle means of utilized flake and core classes and between length and width means, and chert source location frequencies of core and marginally retouched flake classes.

The evidence cited above would seem to indicate that flake tools were not derived only from cores represented on the site. This is not to say that some flakes struck from cores did not serve as flake blanks. Flakes were undoubtedly detached from cores for some purpose. The presence of negative flake scars on cores which are smaller than the smallest flake tools indicate one of two alternatives. First, spalls were detached from cores until flakes which were considered unsuitable for use as blanks were produced. In other words, the small flake scars on cores represent the production of useless flakes, which may have been the factor which led to the cores' discard. Alternatively, small flakes may have been systematically produced, but were used for such short periods of time and/or for such light duty tasks that no detectable use wear traces were produced, given the low power microscopic technique employed in this study.

The tests used to determine if flake tools were derived from cores or not gave no clear answer to that question. The core sample recovered from the site might not be representative of the core reduction system as a whole. Flake blanks may have been produced off the site and then brought back. The presence of flake tools made of Flint Hills green, Cresswell, and three miscellaneous cherts; and the absence of such raw materials in the core sample indicates that such behaviors may have taken place. The higher incidence of retouched tools derived from bedrock/residual deposits than for cores also suggests that some blanks might have been produced off the site. Abundant local, but low quality, stream cobbles were used to produce ad hoc flake tools on the site. Another definite possibility is that flake blanks were, in part, selected from the by-products of biface manufacture.

Chunks and Shatter (n = 167)

Chunks and shatter are pieces of chippable stone that exhibit the following significata: (1) at least one broken surface, (2) polymorphic

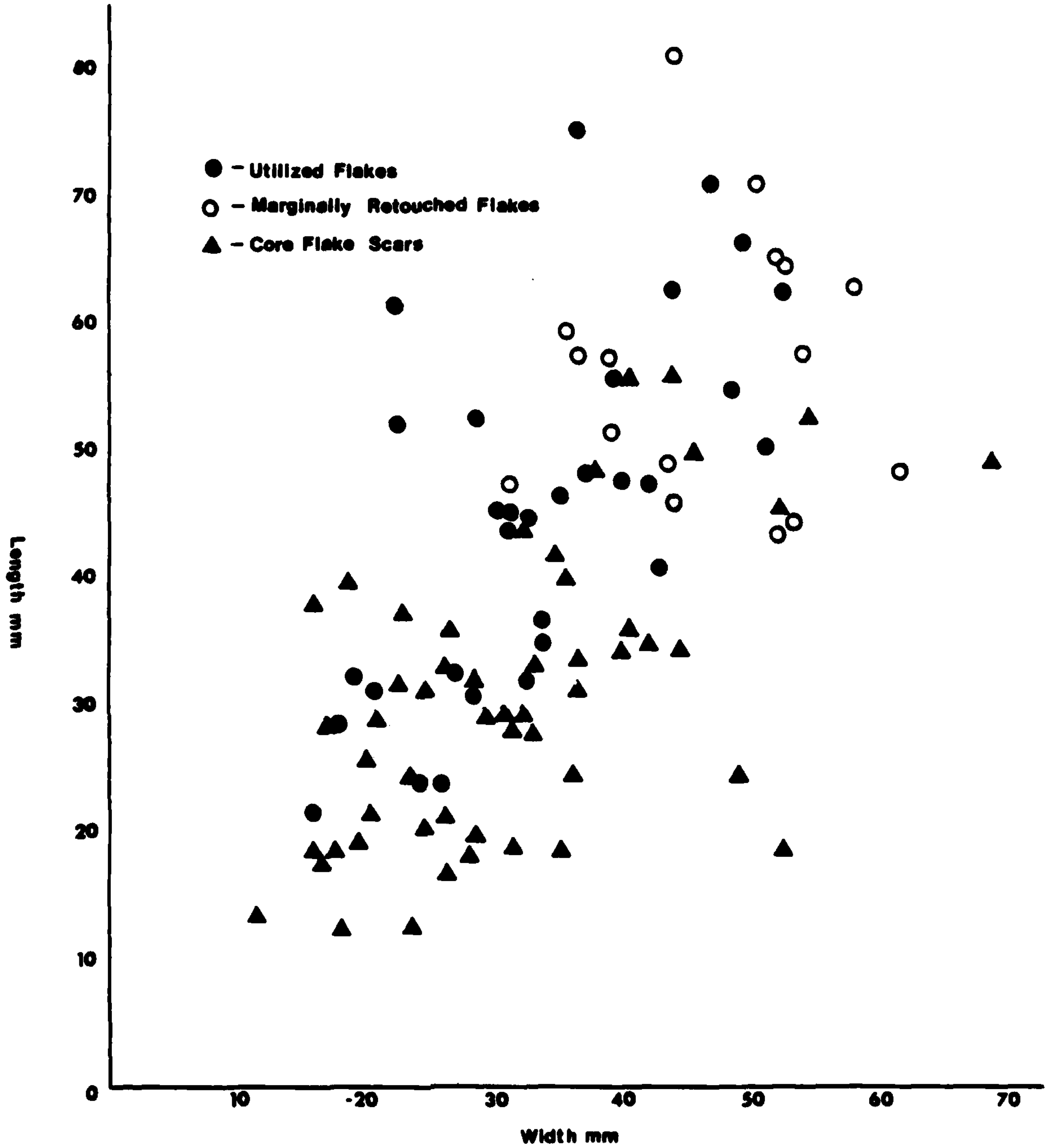

Figure 3.22. Scatterplot of length and width for core negative flake scars, utilized flakes and marginally retouched flakes.

shapes, and (3) surfaces which tend to intersect as corners, i.e., at roughly 90° angles. Chunks and shatter do not exhibit the following characteristics: (1) striking platforms and (2) fracture surfaces with the characteristics of conchoidal fractures. Binford and Quimby term this type of stone debris "shatter". They further subdivide this class into "primary shatter" and "secondary shatter". Primary shatters are defined as pieces of lithic waste which are relatively massive and have unsystematic, cubical, internal cleavage planes which lack bulbs of percussion; pieces may or may not be cortical. These materials are purported to result from heavy percussion blows delivered to pieces of raw material during initial reduction (Binford and Quinby 1972:354). Secondary shatters are defined as amorphous pieces of stone, usually small slivers, broken or snapped flakes, or broken distal ends of flakes. Debris of this kind is more frequently associated with modification of flake blanks (Binford and Quimby 1972:364). Recognizable pieces of flakes are not classified as shatter herein, but as flake fragments.

No distinction is made in this study between primary and secondary shatter; there are several reasons for this. First, although large, primary shatter cannot be produced during blank reduction, small, secondary shatter is a by-product of both initial reduction and blank modification. Second, the distribution of chunk and shatter weight values is unimodal and continuous. Metric data do not support the postulation that two distinct processes were operative in the production of chunks and shatter. Lastly, the distribution of specimen weights is approximately lognormal. The median value (0.6 gm) is considerably smaller than the arithmetic mean (6.0 gm) and the geometric mean (1.3 gm) is close to the median; these are indications that the distribution is approximately lognormal. A lognormal distribution is expected if chunks and shatter represent series of independent breakages of large pieces of raw material (Aitchison and Brown 1963:26-7,100-1).

During analysis, it was observed that many specimens derived from stream cobbles are badly thermally damaged. These pieces are extensively potlid fractured, crazed, blackened, and/or have crenulated fractures. These phenomena occur when chert is rapidly heated or cooled (Purdy 1975). Thus, many chunks are the result of poorly controlled heating of chert. On this basis, it is postulated that thermoclastic breakage which resulted from use of chert as hearthstones and/or boiling stones is one process by which chunks and shatter were produced. Thus, many specimens may not have even participated in the lithic manufacturing system.

As shown in Table 3.32, Florence A, Florence B, and Flint Hills light gray chert make up the identified cherts in the sample. Heated and unheated specimens of bedrock/residual and alluvial cherts, and noncortical debris are present. These facts imply the importation and subsequent reduction of bedrock/residual cherts on the site. Raw materials may or may not have been heated prior to break up. Chunks from block or nodule break up might have been used as boiling stones in the same manner as unmodified raw materials. In general, raw material reduction of the chert types mentioned above, along with two miscellaneous cherts, from streams and upland source locations are documented

Table 3.32. Chunks and shatter: crosstabulations of chert type, thermal alteration and mode of occurrence.

Chert Type	Bedrock/Residual		Stream		Indeterminate	
	Heated	Not Heated	Heated	Not Heated	Heated	Not Heated
Florence A	6	1	2	1	14	1
Florence B	2	4	5	5	39	42
Flint Hills light gray	-	-	-	-	3	1
Miscellaneous	-	-	-	-	1	1
Indeterminate	3	8	2	10	7	7
Total	11	13	10	16	65	52

by the presence of chunks and shatter.

Ground Stone and Minerals

Ground Stone (n = 21)

Ground stone tools are classified according to three dimensions of variability: (1) whether or not tools were mobile during use, (2) shape of the primary working surface (i.e., the largest working surface), and (3) type of use wear (smoothed or battered). These are not the only kinds of use wear possible, but they were the only ones observed. Tool mobility and use wear classifications are based on inferences supported by ethnographic (Spier 1928, 1933), experimental (Spears 1975), and archaeological (Woodbury 1954; Ahler and McMillan 1976:185-9) studies. Large slabs or nodules of raw material are inferred to have been stationary during use; such as metates or anvils. Smaller nodules and slabs are assumed to have been hand held. All of these tools are less than 18 cm in length, which is the maximum dimension given by Woodbury for one-hand manos (1954:79). Smoothed surfaces are those which exhibit flat and/or featureless areas; surfaces cut through fossil inclusion and individual grains in the raw material matrix. This paradigmatic classification produces 12 classes, only five of which have denotata (Table 3.33). Metric attribute data for these artifacts are presented in Appendix C, Table C.7.

Four raw materials are represented in the groundstone series; weathered chert, sandstone, quartzite, and Florence B chert. Weathered chert is desilicified residual chert. It has been collected in the uplands between Satchel and Bemis Creeks and in the northern El Dorado lake area, west of the Walnut. This material has been previously ident-

Table 3.33. Three dimensional paradigmatic classification of ground stone tools.

Stationary Tools

	Convex	Concave	Planar
Smoothed	-	3	-
Battered	-	1	-

Nonstationary Tools

	Convex	Concave	Planar
Smoothed	6	2	-
Battered	3	-	-

ified as dolomite, which it is not (Grosser 1977). Sandstone is not known to occur in the immediate El Dorado vicinity, but small outcrops are present in southern Cowley County, south of El Dorado (Bass 1929: 41-3). Whether or not the sandstone at 14BU25 is derived from these exposures to the south is not known. Quartzite is scattered sporadically throughout the El Dorado area, but is more common to the south in the Arkansas River valley.

Stationary Tools with Smoothed, Concave Working Surfaces (n = 3)

These three artifacts are grinding slab fragments which were shaped primarily by use. One fragment (14BU25-1) was recovered from the surface of the gully and is assumed to be associated with the buried deposit (Fig. 3.23). It is a lunate-shaped piece of weathered chert, probably originally circular or oval in plan view. The working face has been shaped primarily by use, but has also been pecked, probably to roughen it and thereby increase grinding efficiency (Spier 1933:128). The worn surface is evenly concave; all sides are rounded. Working motion was probably circular. The central portion of the bottom of the stone has been pecked, producing a flat surface; this is where the grinding slab rested during use. Another fragment is a rectangular sandstone slab (Fig. 3.24a). One side has been smoothed by use producing a slightly concave working surface. Striations on the working surface intersect one another at various angles, suggesting irregular use-motion. The third fragment is a small piece of sandstone with a highly concave working surface. The concavity depth varies con[illegible]derably, [illegible]ising to the tool's upper surface at one end. The fragme[illegible] fr[illegible] one end of the original slab, where grinding began and/or end[illegible]. All three frag-

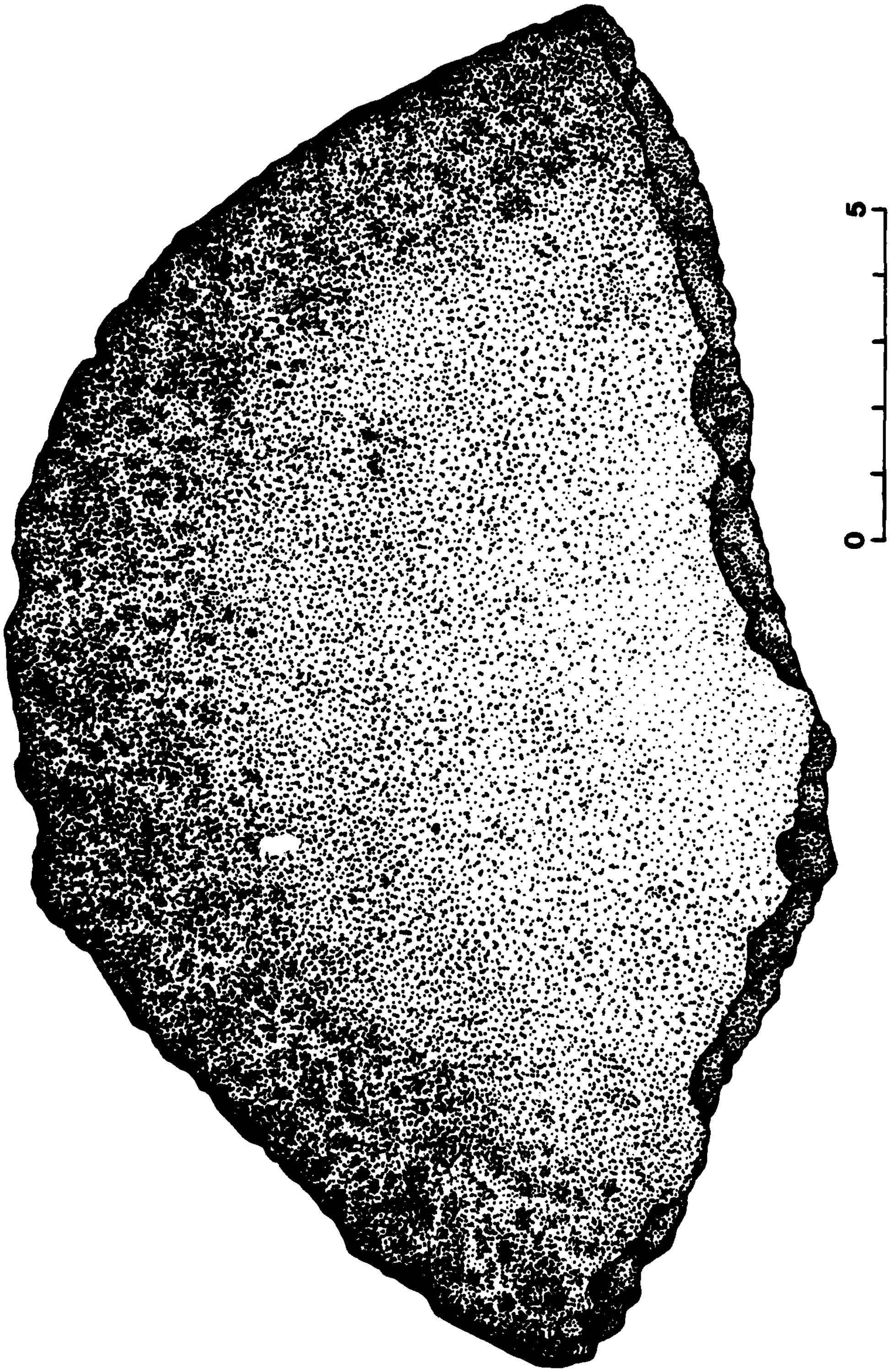

Figure 3.23. Grinding slab fragment (14BU25-1).

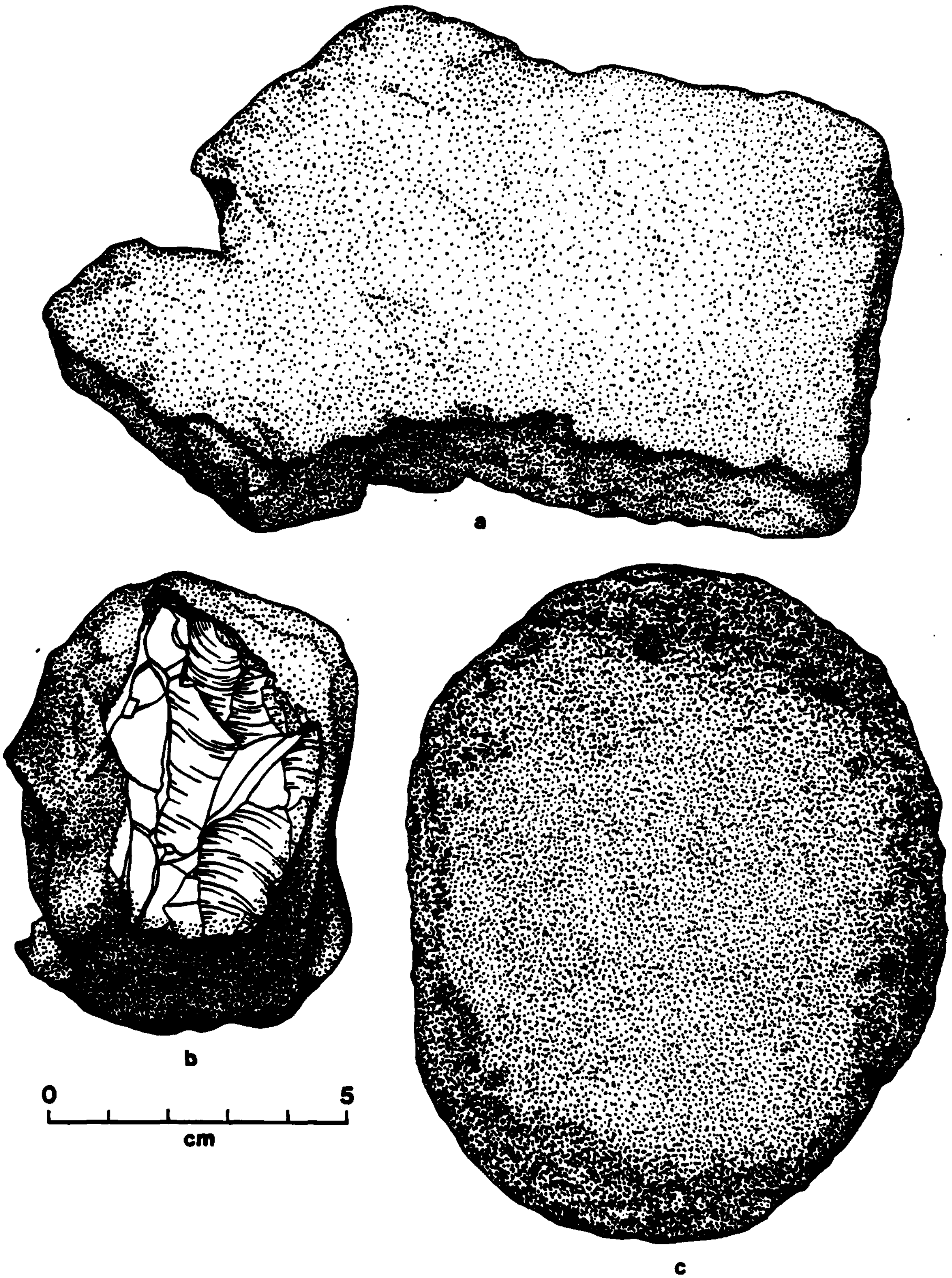

Figure 3.24. Ground stone tools: (a) sandstone grinding slab fragment (A44161); (b) Florence B chert hammerstone (A13999); (c) one-handed mano (A44129).

ments described above represent tools used to grind foods such as seeds or nuts. No evidence for pigment processing is observable. There are iron oxide stains present, but these occur on worked and unworked surfaces and result from natural inclusions in the raw material.

Stationary Tools with Battered, Concave Working Surfaces (n=1)

The only tool in this class is a large nodule of weathered chert with two slightly concave, pecked areas on each major surface. This stone served as an anvil for activities such as pounding nuts or knapping chert cobbles (Spears 1975; Ahler and McMillan 1976:85). One lateral edge is also battered; the cobble probably also functioned as a large hammerstone. Thus the term "stationary" here is applicable only to the uses which produced most surface damage.

Nonstationary Tools with Smoothed, Convex Working Surfaces (n = 6)

These tools show various degrees of smoothing on one or two surfaces; they were probably used as one-hand manos. All are made from weathered chert nodules. Tools are oval to circular in plan view (Fig. 3.24c). Three manos have at least one surface that is pecked and smoothed; pecking probably served to roughen the grinding surface, not to shape the mano, in the same manner as described for grinding slabs (Spier 1933:128). Five manos exhibit various degrees of battering along lateral edges. Manos were sometimes used to crush grains by pounding them on a metate with tool edges before grain was ground (Spier 1928:114). Lateral edges on recovered tools may have been modified in such a manner, or by pecking other grinding surfaces. Three manos are differentially worn; smoothing continues farther up one edge than the other and degradative wear is more pronounced on that side. This type of wear develops when one edge is habitually held toward the user. The far edge (that edge away from the user) is raised during the downstroke, thus putting the greatest pressure on the near edge of the mano directly under the user's hand (Woodbury 1954:69). These tools were probably used to process plant foods in conjunction with grinding slabs.

Nonstationary Tools with Smoothed, Concave Working Surfaces (n = 2)

Members of this class consist of two sandstone tools, one complete and one fragmentary, with smooth, shallow, linear, U-shaped grooves running down the longitudinal axis. Grooves range from 7 to 15 mm in width; no groove is fully semicircular, thus groove widths do not equal the maximum diameter of worked objects. These tools are similar to "shaft smoothers", but may have actually been used to smooth shafts, sharpen wood or bone tools, and/or grind biface edges.

Nonstationary Tools with Battered, Convex Working Surfaces (n = 3)

Two of these tools are ovoid with battered poles. One specimen is a chert nodule from a stream deposit; working surfaces are crushed and step fractured (Fig. 24b). One face has numerous fracture surfaces along internal cleavage planes. This tool probably represents a lithic per-

cussor; chert hammerstones often break after repeated impacts (Spears 1975:96). The other tool, which is made of quartzite, also has damage patterns comparable to those produced by hammerstone use. The third tool in this class is a cylindrical piece of weathered chert. One end is battered, but is only slightly convex with a large working surface (5.1 by 3.4 cm). This tool was used as a percussor, but the worked material is unknown. The working surface is probably too broad and flat to have been used efficiently in flint knapping.

Unidentifiable Smoothed Fragments (n = 6)

These small fragments exhibit at least one smoothed surface. Five are of weathered chert and one is white quartzite. Working surfaces are all convex, suggesting these fragments are broken manos.

Minerals

One cubical crystal of galena was recovered (FN985). The small crystal weighs 5.0 gm. Galena does not occur naturally in Butler County, but is found in Elk and Chataqua Counties, directly to the southeast (Tolsted and Swineford 1957:43-4). Galena sources are common in southeastern Kansas, northeastern Oklahoma, and southwestern Missouri. Galena was commonly used to produce black pigment (Ahler and McMillan 1976:189; Walthall et al. 1980). Ten small pieces of hematite were also recovered which weigh a total of 1.8 gm. Hematite has been collected from local limestone and shale deposits, but it is not common. Hematite is a common source of red pigment.

Features

Six features, consisting primarily of limestone, were excavated in 1969 and 1970; no features were encountered during other investigations. Chipped stone tools, charcoal, burned earth, and burned and unburned bone were associated with these features. Plan views of the limestone in the features are illustrated in Fig.3.25. Concentrations of limestone are posited to represent two broad functional classes. Two limestone piles represent dumps of hearth cleaning debris and the remaining four concentrations represent the remains of cooking features where stones were used to either transfer or contain heat.

Limestone hearthstones undergo continuous reduction in size throughout their use-lives. This is due to thermoclastic fracture and erosion of fire softened exteriors. Reid (1978:203) has postulated that when hearthstones reach a size of approximately 4 cm in diameter, they become inefficient heat conductors. Thus, piles of hearth cleaning debris are dominated by stones smaller than 4 cm. while remains of functional cooking facilities contain larger stones. A cumulative percentage graph of two centimeter intervals for maximum dimension illustrates that features two and six were made up primarily of small limestones. These are postulated to represent hearth cleaning debris dumps. The remaining limestone features are postulated to represent cooking facilities (Fig. 3.26).

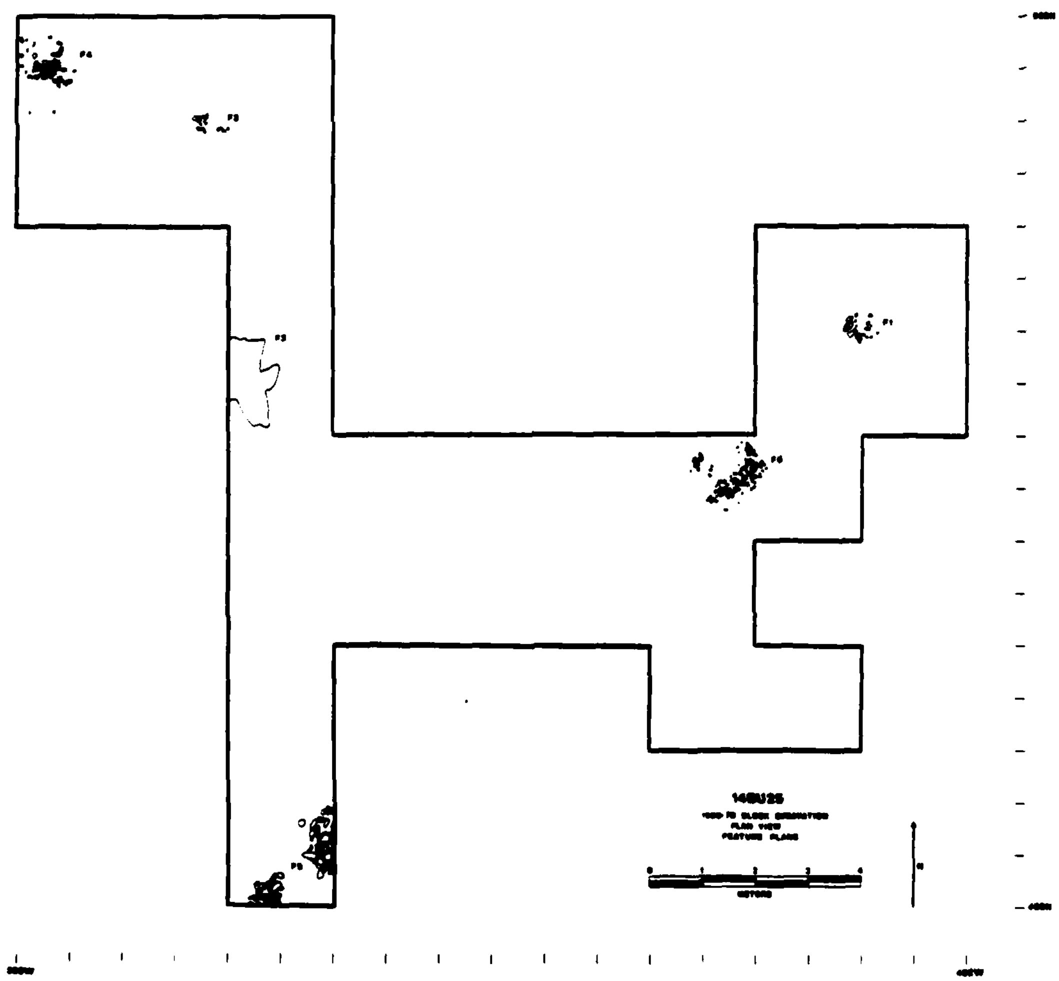

Figure 3.25. Plan view of the 1969/1970 block excavation and feature plans.

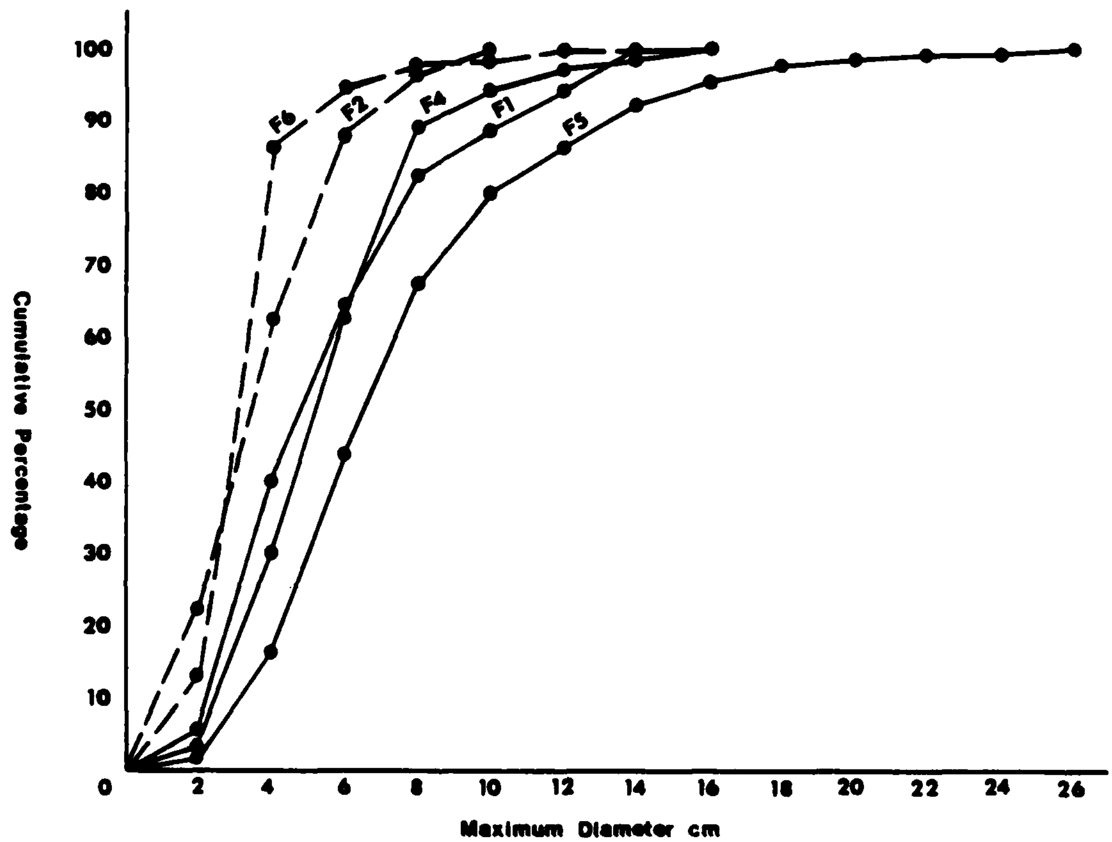

Figure 3.26. Cumulative percentage graphs of limestone maximum linear dimension for features 1, 2, 4, 5, and 6.

Fig. 26 does not include a graph for feature 3. With the exception of feature 1 and 2, all limestone was not collected during excavation, but sampled. Measurements are therefore estimated from scale drawings of feature plans. However, the drawing of Feature 3 consists only of an outline; individual stones are not drawn in. Therefore, it could not be included in Figure 3.26. The sample collected from feature 3, however, contains the largest specimens collected from the site. Therefore, although the nature of the entire distribution of limestone sizes is not known, it is hypothesized that feature 3 also represents a cooking facility. A single large limestone slab recovered from feature 3 weighs 4,528 grams. Maximum linear dimension, number of limestones originally present, number of limestones sampled, and gross weight of sampled pieces are listed for all features in Table 3.34.

Limestone Cooking Facilities

These four features (1, 3, 4, 5) are quite variable in size and shape, and probably represent several cooking techniques. Feature 1 was a circular concentration of burned limestones, all resting on the same horizontal surface. Stones were located around the perimeter of the feature, forming a small ring. Only one layer of rocks made up the feature; these slightly overlapped each other in places, however. The vertical extent is simply the thickness of individual limestones which average about 3 cm; 8 cm is the maximum. Small pieces, and several concentrations, of burned earth and small pieces of charcoal are interspersed throughout the feature matrix. One large limestone was fractured into five pieces, in place. These observations support an inference that this feature was a small open hearth. There is evidence of in situ burning and thermoclastic fracturing of limestone. Unburned bison calcaneus, astragalus,

Table 3.34. Descriptive data for features.

Feature	Dimensions	Number of Limestones	Sampled Limestones	Gross Weight gm	Weight $\bar{X}$ gm
Cooking Facilities					
Feature 1	70x67x8 cm	33	33	2,604	78.9
Feature 3	169x92x25 cm	?	73	23,124	316.7
Feature 4	122x94x13 cm	106	52	3,459	66.5
Feature 5	182x162x19 cm	191	105	20,565	195.9
Hearth Cleaning Debris					
Feature 2	92x42x2 cm	27	27	1,341	49.7
Feature 6	142x134x6 cm	195	21	2,311	110.0

and naviculo-cuboid bones, all of which articulate, were recovered from the middle of the feature. Since these foot bones are unburned, they may have been discarded into the hearth when it was not in use. Any food cooked in this hearth would have been cooked over an open fire.

Feature 3 is a large, irregular concentration of burned limestones; it continued into the west wall of the block excavation, and therefore, the complete dimensions remain unknown. Stones were deposited in a basin-shaped depression or pit 25 cm. deep. No pit outline was discerned, feature limits are marked solely by the extent of limestone. Bifacial tools, burned and unburned bone, chert debitage, and small flecks of charcoal and burned earth were recovered from feature matrix. No evidence of in situ burning was observed. No difference could be perceived between feature matrix and the surrounding soil. A thin layer of rocks surround the top of the basin-shaped pit.

It is postulated that this feature represents a subterranean baking or roasting oven. A pit, slightly over one meter in diameter, was excavated and filled with hot rocks and food items. The oven may have then been sealed with dirt to conserve heat. The oven was subsequently at least partially dismantled, food items being removed. The pit was backfilled with limestone and dirt; some of the stones remaining scattered around the pit perimeter. This postulated sequence of events accounts for the presence of a pit which is filled with large slabs of burned limestone, but which lacks evidence of in situ burning and has stones scattered around its perimeter. Undoubtedly, other explanations could be adduced. Fifty-six pieces of burned and unburned bone were collected from feature matrix, but almost no charcoal or other carbonized plant material. The feature may have been used to cook only meat or possibly plants that would not survive into the archeological record such as tubers.

Feature 4 is an irregular cluster of large slabs and nodules of burned limestone. No evidence of in situ burning was observed and no difference between internal and external matrix was observed. The size of the limestone pieces suggests that this feature functioned as a cooking facility, but no pit is present. Rocks were probably stacked on the ground surface after being transferred from some other heat source. The only other associated cultural debris consists of a few chert flakes. The lack of food remains may indicate plant foods with no durable by-products were prepared. The interpretation of this feature as a surface cooking facility is somewhat speculative.

Feature 5 is similar in many respects to feature 3; there is no evidence of in situ burning, internal matrix and surrounding soil is similar, chipped stone tools, flakes, and bone were directly associated, and the feature consists mainly of an irregular scatter of large pieces of burned limestone. This feature is actually two concentrations located in the same provenience unit, but separated by about 30 horizontal centimeters. One concentration extends for 15 vertical cm, the other 19 cm. Both extend into unexcavated portions of the site making true horizontal extent unknown. Limestones are contained within shallow, basin-shaped pits or natural depressions with irregular scatters of limestone around their per-

imeter. These limestone concentrations are posited to represent shallow roasting ovens similar to feature 3, which have been backfilled subsequent to use. One important difference between the two features, however, is that feature 5 contained more charcoal. A 50.6 gm sample was consolidated from the feature and submitted for radiocarbon assay. The resulting date (4435±100 B.P.:2485 B.C.) was discussed above. The sample consisted of small pieces (about 5 mm in diameter) of wood charcoal which was picked from the matrix during excavation.

Hearth Cleaning Debris

As stated above, hearth cleaning debris scatters are identified by the predominance of small (less than 4 cm) pieces of burned limestone. These concentrations also lack the large slabs associated with cooking facilities. Another distinguishing trait of hearth cleaning dumps on 14BU25 is their relatively shallow vertical extent. Feature 2 is only 2 cm thick and feature 6 only 6 cm. Limestone scatters are irregular in outline and thin; these traits probably reflect the fact that stones were merely dumped and strewn over the ground rather than stacked or placed in a pit as was the case for roasting ovens. Debris dumps also contain small amounts of charcoal, burned and unburned bone fragments, tool fragments, and chert debris. These artifacts were either transferred from roasting features with the limestones and/or deposited as refuse during separate disposal episodes.

Fauna and Flora

A total of 862 bones and bone fragments were three dimensionally plotted during the 1969 and 1970 excavations, 166 pieces of bone were recovered during 1979 operations and hundreds more uncounted fragments were retrieved during 1973. Out of this total of over 1000 specimens, 153 are identified to at least the level of Order. Bones were identified using a combination of personal knowledge, identification manuals (Lawrence 1951; Olsen 1964; Gilbert 1973), and on extensive comparative collection curated at the Museum of Natural History, University of Kansas. Identifications were confirmed by Dr. Larry Martin, professor of vertebrate paleontology, University of Kansas.

The identified sample is small, taxa are represented by only a few individuals each (MNI). Given the small amount of the site that was excavated, preservation biases (see below), and the small sample size, it is likely that only a small fraction of the animals actually exploited, in a quantitative sense, are represented (cf. Guilday 1977). Due to these limiting factors, the subsistence system is discussed primarily in qualitative terms. A list of all identified elements is given in Appendix D, Table D.1. Minimum numbers of individuals (the grand minimum total (Chaplin 1971:70-5) are given in Table 3.35.

In general bones from the Milbourn site are not well preserved. The sample is dominated by small unidentified fragments. This condition is due, in part, to cultural processes, bones were extensively broken for marrow extraction and bone grease preparation (see below). Boiling and

Table 3.35. Minimum numbers of individuals of fauna recovered from 14BU25

Taxon	Common Name	No. of elements	MNI
Antilocapra americana	Pronghorn	59	3
Odocoileus sp.	Deer	12	2
Bison bison	Bison	14	1
Cervus canadensis	Wapiti	3	1
Lepus californicus	Black-tailed jack rabbit	9	2
Sylvilagus floridanus	Eastern cottontail	3	1
Canis latrans	Coyote	5	2
Vulpes fulva	Red fox	1	1
Procyon lotor	Raccoon	2	1
Castor canadensis	Beaver	1	1
Geomys bursarius	Plains pocket gopher	1	1
Microtinae (sub-family)	Mice	1	1
Terrepene ornata	Eastern Ornate box turtle	4	1
Aves	Bird	2	1
Pices	Fish	6	2

roasting bone results in organic matter loss and subsequent accelerated decomposition (Chaplin 1971:14-5). Soil Ph values from XU101 (1979) in the area of cultural midden ranged from 7.0 to 7.2. These values are slightly basic, and therefore, soil acidity probably did not play a role in bone degradation. Although it should be realized that soil conditions can change through time and may vary horizontally. Rodents and carnivores eat bones. No direct evidence of carnivore action is present, but some bone breakage may not have been cultural. Rodent incisor marks are present on several bones, direct evidence of attrition. Bones may also be broken into small fragments by frost heaving or shrinking and swelling of clayey soils. A pronghorn calcaneus (A4989/A4822) is broken in half; the fracture is not a fresh (spiral) bone break. These two pieces are separated by only a few cm horizonally, but by 22 cm vertically. This pronounced vertical displacement may be due to cryoturbation or agrilliturbation and these may also be the mechanisms responsible for breakage (cf. Chaplin 1971:18).

Identified faunal elements are dominated by dense bones. Sixty-four of 128 mammal elements are teeth, which are dense and more resistant to decay than other bones. Articulator ends of limb bones, tarsals, and metapodials make up another 25 specimens. Thus, the mammalian assemblage

is dominated by dense bones. These are the ones with the greatest chance of survival if all anatomical portions are originally introduced (Chaplin 1971:16-17; Binford and Bertram 1977). The point of this short discussion is that various factors of differential preservation have biased the composition of the recovered assemblage.

Identified faunal elements represent animals that lived in all ecological resource zones postulated to have been present in the El Dorado locality. This is expectable given the fact that all zones are present in the immediate area of the site. Animal procurement appears to have centered around the large species which lived primarily on the upland prairies and to a lesser extent in the wooded bottom lands. A variety of smaller mammals and the presence of reptiles, birds, and fish indicate a wide variety of animals were procured, although these undoubtedly made up relatively small dietary contributions (in terms of bulk).

The small number and poorly preserved condition of identifiable remains makes firm conclusions concerning the exact nature of subsistence upon faunal resources impossible. However, in relation to other local Archaic faunal assemblages, several broad patterns are apparent. Remains from the El Dorado and Chelsea phase deposits at the Snyder site suggest a reliance on large upland ungulates and deer. Pronghorn, deer, and bison represent the dominant animals, by weight, in the faunal samples. However, a variety of smaller mammals and non-mammalian fauna are also present, especially in the El Dorado phase assemblage (Grosser 1977:100-03). An emphasis on upland artiodactyls is expected in a prairie region such as the Flint Hills.

Most artiodactyl long bones and four foot bones exhibit spiral fractures (Appendix D, Table D.1). This type of fracture occurs when fresh bones are broken. Humans and large carnivores can both alter bones in such a manner. However, no tooth perforation holes or gnawing and scooping out marks, which are diagnostic of carnivore activity, were observed (Bonnichsen 1973). Therefore, fractures are assumed to be a result of human activities. Bones are broken to extract marrow for use as food. Shaft portions may be further pulverized and then boiled to prepare bone grease and/or soup (Bonnichsen 1973; Vehik 1977). When identifiable bone fragments were sorted from undiagnostic pieces, numerous long bone splinters with spiral fractures were observed. Many other small, poorly preserved or burned pieces were noted. Although these observations are not quantified, they support the hypothesis that bones were smashed up for marrow extraction, and bone grease and soup preparation. Extensive use of bones for food also creates biases in faunal assemblages as bones are sometimes crushed beyond identification.

A sketchy subsistence pattern may be inductively derived from recovered elements at 14BU25. The poorly preserved sample suggests a reliance on large artiodactyls, particularly those which roam the uplands. A variety of small mammals and non-mammalian species from all local microenvironments were also exploited. Large and small mammals were probably sources of fur, hides, and other raw materials. Extensive utilization of resources is suggested by bones which have been broken for marrow extrac-

tion and grease and/or soup preparation. Even some of the toe bones exhibit spiral fractures, which generally produce lower quantities and quality of marrow than other bones (Bonnichsen 1973).

Flora

Soil samples were taken from all features, excepting feature 1, and from various depths in various 2 by 2 meter provenience units during 1969/1970 excavations. Original soil sample sizes are unknown, as is the processing technique. Judging from the size and composition of processed samples, water screening, but no flotation, was used. Samples contain clay balls, small size debitage, bone fragments, and small limestones. The size of the screen mesh that was used is unknown. Therefore, interpretation of remains is difficult. Soil samples from 1979 work have not yet been completely processed, but limited sampling means that results reported here will not alter much upon their completion.

Plant remains from the Milbourn site are almost nonexistent. One carbonized goosefoot seed (Chenopodium sp.) was recovered from feature 6 and seven carbonized goosefoot seeds came from feature 5. The low number of seeds may reflect lack of use, insufficient opportunity for preservation, or lack of adequate techniques for proper recovery. As such, statements concerning uses of plants for subsistence or other purposes are not possible. However, 12 tools inferred to have been used in plant processing tasks were recovered (see ground stone). Therefore, use of plant foods on the site is likely. Lack of remains could possibly indicate that plants with low preservation potential were used (e.g., starchy roots and tubers, or greens).

Summary and Conclusions

Placement of 14BU25 Within the Settlement System

A wide variety of maintenance and extractive tasks are represented by tools, chert debitage, faunal remains, and features from 14BU25. General functional categories for flake tools are quantified in Table 3.36, and for ground stone tools and bifaces in Table 3.37. All tools excepting indeterminate biface fragments and ground stone tools are included. These groups are separated because flake tools generally have much shorter uselives than do bifaces and ground stone (Gould 1977). Differences in uselives of all classes make the following comparisons, of necessity broad.

Most flake tools are inferred to have functioned as cutting and scraping tools used on hard materials. Since no worked bone or antler was recovered, wood was probably the dominant worked material. Light duty cutting tools make up about one fifth of the flake implements. Thus extractive tasks (butchering) are represented about one fourth as much as maintenance tasks (hide, wood, bone, and antler working).

Activities represented by bifacially chipped and ground stone tools form the opposite pattern; extractive tools outnumber maintenance tools.

Table 3.36. General functional categories for flake tools (n = 164).

Function	Tool Class	n	%
Light Duty Cutting (butchering):			
	Utilized Flake	27	16.4
	Marginally Retouched Flakes	2	1.2
	Subtotal	29	17.6
Hideworking:			
	Utilized Flakes	8	4.9
	Marginally Retouched Flakes	17	10.4
	Subtotal	25	15.3
Woodworking (bone, antler):			
	Utilized Flakes	77	47.0
	Marginally Retouched Flakes	32	19.5
	Subtotal	109	66.5
Indeterminate:			
	Marginally Retouched Flakes	1	0.6
	Subtotal	1	0.6
	Total	164	100.0

Hunting, butchering, and plant processing are represented by 65.1% of recovered tools. Maintenance activities including stoneworking (hammerstones, the anvil, and manufacturing rejects) and woodworking tools make up 33.85% of the biface and ground stone assemblage. Once again, it is stressed that relative occurrence of different tool classes is not directly equatable with relative occurrence of past activities because of differential tool use-lives. Additional stoneworking activities are represented by cores, chunks and shatter, and over 15,000 flakes. Primary and secondary decortication, trimming, and resharpening flakes represent the entire range of flint knapping behaviors from initial raw material reduction to tool resharpening. Chunks and cores also represent the initial stages of flint tool manufacture. Presence of hematite and galena implies at least minimal pigment production; this activity is usually associated with ceremony and ritual.

Limestone-filled roasting pits and burned and splintered bones of numerous species suggest preparation and consumption of animal meat, marrow and possibly bone soup and/or grease.

Tools representing extraction activities dominate the biface assemblage, but a variety of maintenance tools are also present. Many flake tools, especially unretouched ones, represent "ad hoc" tools which are

Table 3.37. General functional categories for bifaces and ground stone tools.

Function	Tool Class	n	%
Hunting/Butchering: (Hideworking)			
	Stemmed Bifaces	69	25.6
	Subtotal	69	25.6
Butchering (Hideworking):			
	Unstemmed Bifaces with Distally Converging Lateral Working Edges	90	33.5
	Preforms	4	1.5
	Ovate Bifaces	1	0.4
	Subtotal	95	35.4
Plant Food Processing:			
	Grinding Slabs	3	1.1
	Manos	6	2.2
	Ground Stone Percussor	1	0.4
	Transverse Working Edged Biface	1	0.4
	Subtotal	11	4.1
Stoneworking:			
	Hammerstones	2	0.7
	Anvil	1	0.4
	Subtotal	3	1.1
Woodworking (Bone, Antler):			
	Unstemmed Bifaces with Distally Converging Lateral Working Edges	1	0.4
	Transverse Working Edge Bifaces	5	1.9
	Ovate Bifaces	25	9.3
	Marginally Retouched Nodules and Tabloids	13	4.8
	Preforms	26	9.7
	"Shaft Smoothers"	2	0.7
	Subtotal	72	26.8
Unused (Manufacturing Rejects):			
	Unstemmed Bifaces with Distally	4	1.5
	Converging Lateral Working Edges	9	3.3
	Preforms	3	1.1
	Ovate Bifaces	16	5.9
	Subtotal		
Indeterminate:			
	Preforms	3	1.1
	Subtotal	3	1.1
	Total	269	100.0

usually used once and discarded (Gould 1977). Retouched flakes are used more intensively, evidenced by resharpening on a few of them. The actual proportion of extractive and maintenance tasks is difficult to determine. All invasively and marginally retouched chipped stone tool classes show evidence of extensive maintenance and occasional modification, implying extensive use. Therefore, it can only be reliably inferred that a wide variety of maintenance and extractive activities are represented.

Documented activity diversity indicates that 14BU25 was a base camp. As noted in the site description, no organic staining was observed in the occupation zone. Chemical tests of soil samples also indicate a general decrease in organic content with depth; no correlation with the prehistoric occupation zone is present. Based on data presented above, it is hypothesized that although a base camp is represented, there was not a prolonged occupation by a large population aggregate. It is hypothesized that several occupations by related groups took place, for periods of time ranging from perhaps several weeks to a month. The thickness of the deposit suggests more than a single occupation occurred.

Little evidence for the season of occupation is present. The site is located in an exposed area on the edge of a tributary valley. No evidence for the presence of former structures has been recovered (i.e., daub, postmolds, house floors). No areas of intense, in situ burning were located, although remains of a small campfire and large amounts of burned limestone were recovered. Four carapace fragments of the eastern ornate box turtle and 12 turtle carapace fragments unidentifiable to species were retrieved. Availability of ornate box turtles is restricted in cold weather. The above circumstantial evidence gives inductive support to an hypothesis of warm weather occupation. Occupation during the spring months may have been undesirable due to threat of flooding; peak rainfall periods are in May and June. However, since the periodicity of flooding at the time of occupation is not presently known, spring and early summer camps are not ruled out.

APPENDIX A

The level of significance is set at 5% for all statistical tests. Null Hypotheses of chi square tests state that variables under consideration are independent, alternatives state dependence.

Table A.1. Chi square contingency table: thermal alteration and chert type for cortical flakes.

Chert Type	Thermal Alteration (observed/expected)	No Thermal Alteration (observed/expected)
Florence A	51/39.2	55/66.8
Florence B	17/29.6	63/50.4

Chi square critical value = 3.84, chi square calculated value = 14.2

Decision: reject H_0; accept H_1

Table A.2. Chi square contingency table: thermal alteration and mode of occurrence for cortical flakes.

Mode of Occurrence	Thermal Alteration (observed/expected)	No Thermal Alteration (observed/expected)
Stream Cobbles	9/17.2	51/41.9
Bedrock/Residual	49/39.9	88/97.9

Chi square critical value = 3.84, chi square calculated value = 8.9

Decision:reject H_0; accept H_1

Table A.3 Chi square contingency table: thermal alteration and reduction state (primary or secondary decortication).

Reduction State	Thermal Alteration (observed/expected)	No Thermal Alteration (observed/expected)
Primary Decortication	3/10.3	30/21.8
Secondary Decortication	77/68.8	137/146.1

Chi square critical value = 3.84, chi square calculated value = 9.9

Decision: reject H_0; accept H_1

Table A.4 Chi square contingency table: thermal alteration and reduction state (secondary decortication and optional trimming).

Reduction State	Thermal Alteration (observed/expected)	No Thermal Alteration (observed/expected)
Secondary Decortication	77/72.7	135/141.1
Optional Trimming and Shaping	449/446.5	866/866.7

Chi square critical value = 3.84, chi square calculated value = 0.52

Decision: cannot reject H_0

Table A.5 Chi square contingency table: thermal alteration and reduction state of Florence A chert (secondary decortication and optional trimming).

Reduction State	Thermal Alteration (observed/expected)	No Thermal Alteration (observed/expected)
Secondary Decortication	51/64.1	49/36.1
Optional Trimming and Shaping	256/241.2	121/135.7

Chi square critical value = 3.84, chi square calculated value = 9.8

Decision: reject H_0; accept H_1

Table A.6. Chi square contingency table: flake utilization and cortical state.

Cortical State	Utilized (O/E)	Not Utilized (O/E)
Cortex	17/17.5	241/240.0
No Cortex	97/96.9	1328/1328.6

Chi square critical value = 3.84, chi square calculated value = 0.02

Decision: cannot reject H_0

Table A.7. Chi square contingency table: flake utilization and chert type.

Chert Type	Utilized (O/E)	Not Utilized (O/E)
Florence A	39/36.6	477/479.0
Florence B	68/68.0	890/889.3
Flint Hills light gray	3/4.6	62/60.0

Chi square critical value = 5.99, chi square calculated value = 0.80

Decision: cannot reject H_0

Table A.8. Chi square contingency table: flake utilization and thermal alteration.

Thermal Alteration	Utilized (O/E)	Not Utilized (O/E)
Heated	33/37.8	531/526.0
Not Heated	79/74.3	1030/1034.9

Chi square critical value = 3.84, chi square calculated value = 0.96

Decision: cannot reject H_0

Table A.9. Chi square contingency table: chert type and artifact class (preforms and bifaces with distally converging lateral working edges).

Chert Type	Distally Converging Edge (O/E)	Preforms (O/E)
Florence A	84/89.4	28/22.6
Florence B	74/68.6	12/17.4

Chi square critical value = 3.84, chi square calculated value = 3.73

Decision: cannot reject H_0

Table A.10. Fisher's exact test contingency table: mode of occurrence and artifact class (preforms and bifaces with distally converging lateral working edges).

	Distally Converging Edges	Preforms	Total
Bedrock/Residual	7	25	32
Stream Deposit	$0 = X$	2	$2 = s_1$
Total	$7 = s_2$	27	$34 = N$

Probabilities for Fourfold Tables:

N	s_1	s_2	X	Obs.	Other	Total
34	2	7	0	.267	.200	.467

Table A.11. Chi square contingency table: chert type and artifact class (marginally retouched and unutilized flakes).

Chert Type	Marginally Retouched Flakes (O/E)	Unutilized Flakes (O/E)
Florence A	24/17.0	477/484.3
Florence B	23/31.0	890/881.5
Flint Hills light gray	3/2.2	62/62.9

Chi square critical value = 5.99, chi square calculated value = 5.43

Decision: cannot reject H_0

Table A.12 Chi square contingency table: cortical state and artifact class (marginally retouched and unutilized flakes).

Cortical State	Marginally Retouched Flakes (O/E)	Unutilized Flakes (O/E)
Cortex (or Patina)	11/8.0	241/243.2
No Cortex	41/43.8	1328/1325.9

Chi square critical value = 3.84, chi square calculated value = 1.32

Decision: cannot reject H_0

Table A.13 Chi square contingency table: thermal alteration and artifact class (marginally retouched flakes and unutilized flakes).

Thermal Alteration	Marginally Retouched Flakes (O/E)	Unutilized Flakes (O/E)
Heated	10/17.3	531/523.1
Not Heated	42/34.3	1030/1038.3

Chi square critical value = 3.84, chi square calculated value = 5.00

Decision: reject H_0; accept H_1

Table A.14. Chi square contingency table: chert type and artifact class (cores, marginally retouched flakes, and utilized flakes).

Chert Type	Cores (O/E)	Marginally Retouched Flakes (O/E)	Utilized Flakes (O/E)
Florence A	7/9.5	24/18.8	38/40.7
Florence B	16/14.5	23/28.9	67/62.5
Flint Hills light grey	2/1	3/2.2	3/4.8

Chi square critical value = 9.49, chi square calculated value = 6.19
Decision: cannot reject H_0

Table A.15. Chi square contingency table: mode of occurrence and artifact class (cores, marginally retouched flakes, utilized flakes).

Mode of Occurrence	Cores (O/E)	Marginally Retouched Flakes (O/E)	Utilized Flakes (O/E)
Bedrock/Residual	8/11.8	15/10.6	10/10.6
Stream Deposit	11/7.2	2/6.4	7/6.4

Chi square critical value = 5.99, chi square calculated value = 8.16

Decision: reject H_0, accept H_1

Table A.16. F tests for differences in population variances.

Groups Compared	Observed F	Critical F	Degrees of Freedom
Core flake scar and Utilized blank width	1.08	1.84	52, 30
Core flake scar and retouched flake width	1.65	2.25	30, 15
Core flake scar and utilized blank length	1.59	1.70	30, 52
Core flake scar and retouched flake length	1.15	2.25	52, 15
Core and utilized blank flake angle	1.41	1.70	25, 52
Core and retouched flake angle	1.69	1.96	13, 52

Table A17. t tests for differences in population means.

Groups Compared	Observed t	Critical 1	Degrees of Freedom
Core flake scar and utilized blank width	-1.11	-1.65 (one-tailed)	82
Core flake scar and retouched flake width	-4.80	-1.67 (one-tailed)	67
Core flake scar and utilized blank length	-5.47	-1.65 (one-tailed)	82
Core flake scar and retouched flake length	-8.34	-1.67 (one-tailed)	67

APPENDIX B

Table B. 1. Edge damage patterns on unmodified flakes.

Edge Damage	Straight	Convex	Concave	Irregular	Row Total
	UNIFACIAL WEAR				
			Working Edge Shape		
Irregular Flaking, Smoothing	2	3	2	-	7
Irregular Flaking, Polish, Smoothing	-	1	-	-	1
Step Flaking, Smoothing	-	1	1	-	2
Step Flaking, Blunting, Smoothing	1	1	-	-	2
Irregular and Step Flaking, Smoothing	7	7	16	5	35
Irregular and Step Flaking, Blunting, Smoothing	1	2	1	2	6
Hinge, Irregular, and Step Flaking, Smoothing	-	-	1	1	2
	BIFACIAL WEAR				
Irregular Flaking, Smoothing	11	6	1	3	21
Irregular Flaking, Polish, Smoothing	1	1	-	1	3
Hinge and Irregular Flaking, Smoothing	-	1	-	-	1
Snap and Irregular Flaking, Smoothing	-	1	-	1	2
Irregular and Step Flaking, Smoothing	8	3	1	4	16
Step Flaking, Blunting, Smoothing	1	-	-	-	1
Irregular and Step Flaking, Polish, Smoothing	1	-	-	-	1
Hinge, Irregular, and Step Flaking, Smoothing	-	1	-	1	2
Snap, Irregular, and Step Flaking, Smoothing	1	2	-	1	4

Table B.2. Edge damage patterns observed on stemmed bifaces.

LATERAL WEAR Flaking &/or Blunting	LATERAL WEAR Smoothing &/or Polish	DISTAL WEAR Flaking &/or Blunting	DISTAL WEAR Smoothing &/or Polish	Fracture	n
+	+	+	+	Impact	1
-	+	+	+	Impact	1
+	+	-	+	Impact	1
-	+	-	+	Impact	1
+	+	0	0	Impact/ Transverse	4
-	+	0	0	Impact	1
0	0	0	0	Impact	1
+	+	+	+	None	12
+	+	-	+	None	1
-	+	+	+	None	1
-	+	-	+	None	5
+	+	+	+	Transverse	1
+	+	-	+	Transverse	1
-	+	-	+	Transverse	2
+	+	0	0	Transverse	20
+	+	0	0	Thermoclastic	1
-	+	0	0	Transverse	7
-	+	0	0	Thermoclastic	1
0	0	0	0	Transverse	7
					69

+ = present; - = absent; 0 = indeterminate

Table B.3. Edge damage patterns observed on unstemmed bifaces.

LATERAL WEAR Flaking &/or Blunting	LATERAL WEAR Smoothing &/or Polish	DISTAL WEAR Flaking &/or Blunting	DISTAL WEAR Smoothing &/or Polish	Fracture	n
+	+	+	+	None	6
+	+	-	+	None	4
+	+	0	0	Transverse	64
-	+	0	0	Transverse	11
-	-	0	0	Transverse	4
+	+	0	0	Transverse/ Edge Collapse	2
+	+	0	0	Transverse/ Thermoclastic	2
+	+	0	0	Overshot Flake	1
-	+	0	0	Overshot Flake	1
					95

+ = present; - = absent; 0 = indeterminate

Table B.4. Edge damage patterns observed on ovate bifaces.

WEAR PATTERNS Flaking &/or Blunting	Smoothing &/or Polish	Working Edge Shape	Fracture	n
+	+	Biconvex	None	3
+	+	Planoconvex	None	
+	+	Planoconvex/Biconvex	None	2
+	+	Planoconvex	Transverse	2
+	+	Biconvex	Transverse	9
+	+	Planoconvex/Biconvex	Transverse	2
-	+	Planoconvex/Biconvex	Transverse	1
+	+	Biconvex	Thermoclastic	1
+	+	Biconvex	Thermoclastic/ Transverse	3
-	-	Not Applicable	Transverse	2
-	-	Not Applicable	Overshot Flake	1

+ = present; - = absent; 0 = indeterminate

Table B.5. Edge damage patterns observed on bifacial preforms.

LATERAL WEAR Flaking &/or Blunting	Smoothing &/or Polish	DISTAL WEAR Flaking &/or Blunting	Smoothing &/or Polish	Grind	Fracture	n
+	+	+	+	-	None	4
+	+	-	+	-	None	1
-	+	-	-	·	None	2
+	+	-	+	-	Transverse	1
-	+	-	-	-	Transverse	1
+	+	0	0	-	Transverse	15
-	+	0	0	-	Transverse	1
-	+	0	0	+	Transverse	1
-	-	0	0	+	Transverse	2
-	-	0	0	-	Transverse	7
+	+	0	0	-	Thermoclastic	2
0	0	0	0	0	Thermoclastic	1
0	0	0	0	0	Transverse	2
+	+	-	-	-	Transverse/ Thermoclastic	2
+	+	-	-	-	Overshot Flake	1
						43

+ = present; - = absent; 0 = indeterminate

APPENDIX C

Table C.1. Metric data forstemmed bifaces.

Cat. No.	Length mm	Width mm	Thickness mm	Weight gm	Stem L. mm	Stem W. mm	Base W. mm
Corner-Notched							
A4927	58.4	34.4	11.0	16.2	12.6	19.9	23.9
A35697	44.9	28.3	8.1	10.8	14.5	23.0	29.1
A4896	50.5	31.7	6.0	11.2	12.7	16.9	20.1
A12830	44.9	26.9	5.2	6.1	9.6	12.0	15.0
A35493	61.5	30.6	8.0	13.9	12.3	20.0	23.8
A15586	49.9	33.7	8.1	13.8	12.3	20.6	23.6
A44189	63.5	47.6	7.6	19.2	13.9	20.7	26.1
A4901	58.9	40.3	9.6	17.3	14.4	21.4	24.9
A4835	53.2	35.5	9.1	15.2	14.2	21.1	24.8
A13630	59.9	39.8	8.7	19.7	11.7	24.2	26.8
A44082	51.3	37.8	7.8	17.0	16.1	18.1	22.5
A44083	52.2	36.6	6.5	10.1	16.2	20.1	26.1
A16780	63.1	41.4	8.6	19.2	11.3	-	-
A13116	-	-	-	-	13.4	21.6	24.0
A16984	-	34.5	7.3	-	14.6	18.9	20.0
A15884	-	44.3	5.7	-	14.0	23.4	27.9
A5153	-	-	-	-	13.0	21.4	23.8
A36807	-	-	-	-	8.1	20.6	21.5
A35727	-	40.9	8.5	-	14.7	23.4	26.9
A35057	-	23.3	5.6	-	9.8	15.2	18.0
A15883	-	37.2	8.6	-	13.4	19.4	23.5
A35641	-	36.0	8.5	-	10.5	21.7	-
A36636	-	-	-	-	14.6	20.6	-
A13462	-	35.9	7.1	-	11.3	23.2	-
A15621	-	-	-	-	14.5	22.6	-
A4874	-	-	-	-	-	-	23.4
A4943	-	-	-	-	11.4	-	-
A5103	-	-	-	-	15.9	19.6	-
Basal-Notched							
A4789	54.7	38.7	9.1	16.1	11.0	21.3	22.9
A44115	60.3	39.5	6.9	13.8	14.0	17.0	17.5
A4941	55.6	37.5	8.4	15.2	12.8	20.6	22.1
A4944	-	38.9	8.0	-	12.1	19.5	22.5
A16096	-	-	-	-	15.0	21.6	22.0
A16101	-	42.5	7.4	-	13.4	20.8	23.2
A35291	-	-	-	-	15.7	17.0	20.1
Side-Notched							
A4873	46.4	27.9	7.5	8.7	14.2	15.9	22.3
A4826	31.4	27.7	5.8	4.8	14.4	20.5	27.7
FN1719	-	27.7	10.3	-	17.9	22.0	27.7
A36806	-	-	-	-	17.5	24.5	27.5
A13114	-	24.4	5.3	-	13.0	14.5	-

Table C.1. (cont.)

Cat. No.	Length mm	Width mm	Thickness mm	Weight gm	Stem L. mm	Stem W. mm	Base W. mm
Modified-Notched							
A44113	43.5	27.2	7.5	9.5	13.4	19.4	21.6
A4834	43.3	34.0	7.1	9.6	14.2	18.6	22.7
A44190	61.1	27.6	7.0	10.1	13.2	14.9	20.9
A12973	-	36.4	9.0	-	13.4	20.4	21.6
Stemmed (Unnotched							
A16983	50.1	18.0	6.5	4.5	9.3	18.0	14.9
A4347	53.0	22.3	7.5	7.0	13.5	19.0	22.3
A4839	-	-	-	-	13.0	23.4	24.9
Indeterminate							
A4895	-	-	-	-	-	18.9	25.8
A4355	-	-	-	-	-	20.3	23.7
A16099	-	-	-	-	-	-	26.6
A44139	-	-	-	-	-	-	23.5
A35687	-	-	-	-	-	-	27.2
A35701	-	-	-	-	-	24.4	24.4
A12264	-	-	-	-	-	-	20.8
A44121	-	35.9	7.8	-	-	-	-
A44084	-	37.7	7.5	-	-	-	-
A44159	-	35.7	8.0	-	-	-	-
A4350	-	39.0	6.3	-	-	-	-
$\bar{X}$	52.7	34.2	7.6	12.6	13.3	20.0	23.0

Table C.2. Metric data for complete unstemmed bifaces with distally converging lateral working edges (n = 10).

Catalog Number	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)
A4953	96.1	40.7	9.4	33.7
A4345	92.3	47.4	11.7	50.8
A44066	93.5	55.8	13.9	69.7
A4952	83.0	43.5	9.1	31.4
A4348	88.6	40.1	9.8	39.6
A4353	70.6	51.0	19.4	52.9
A4724	43.8	20.1	6.5	5.9
A44081	68.2	21.6	9.0	13.3
A44092	86.3	48.6	10.4	37.2
A44112	67.5	44.2	11.1	36.5
$\bar{X}$	79.0	41.3	11.0	37.1

Table C.3. Metric data for bifaces with transverse working edges (n = 6).

Catalog Number	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)
A44109	108.6	84.5	39.1	332.6
A16444	111.5	88.9	31.5	296.4
FN1726	77.0	53.0	27.9	105.3
A44100	60.6	41.7	17.0	52.0
A44054	62.0	45.8	30.4	116.9
A4840	46.2	41.9	11.8	25.3
$\overline{X}$	77.6	59.3	26.3	154.7

Table C.4. Metric data for ovate bifaces (n = 8).

Catalog Number	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)
A4819	78.2	70.4	10.8	51.4
A44157	47.5	43.8	13.3	28.3
A44089/A44090 (cross mend)	54.4	42.8	11.2	27.0
A4803	60.5	50.0	19.3	59.4
A44128	65.7	56.6	21.1	67.1
A44195	63.9	44.2	14.1	42.6
A44087	54.0	43.2	20.5	43.2
A4382	56.9	49.3	15.9	43.1
$\overline{X}$	60.1	50.0	15.8	45.3

Table C.5. Metric data for complete bifacial preforms (n = 9).

Catalog Number	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)
A44218	112.4	69.7	22.0	194.2
A35777	68.6	45.1	7.7	24.6
A44086	77.9	42.0	15.4	49.3
A44108	76.3	45.9	14.3	50.0
A44027/A37316 (cross mend)	78.5	51.4	12.8	49.8
A15259	72.4	62.9	15.8	89.0
A16779	94.8	73.5	23.9	170.6
A4846	66.7	55.5	19.5	72.5
A14791	86.5	57.0	26.6	130.7
$\overline{X}$	81.6	55.9	17.6	92.3

Table C.6. Metric data for marginally retouched nodules and tabloids.

Catalog Number	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)
A14391	124.1	90.1	40.6	429.9
A12764	95.1	63.2	46.7	304.0
A14864	89.9	74.6	20.5	151.9
A14961	103.1	100.9	45.1	396.4
A4841	61.9	97.4	21.7	128.3
A35523	43.4	52.1	29.6	44.3
A15467	49.6	53.0	23.1	51.8
A1733	85.6	58.7	26.4	135.2
A4954	90.7	47.0	25.5	84.7
A44102	100.9	69.6	52.4	328.1
A44193	86.2	54.6	24.9	111.7
A44095	106.5	130.1	39.5	570.0
A44020	107.6	79.9	43.5	318.1
$\bar{X}$	88.0	74.9	33.8	239.8

Table C.7. Descriptive data for ground stone tools.

Catalog Number	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)	Raw Material
Stationary Tools: Smoothed, Concave					
14BU25-1	-	-	39.7	899.4	weathered chert
A44161	-	-	27.0	495.2	sandstone
A37081	-	-	32.7	122.4	sandstone
Stationary Tools: Battered, Concave					
A15600	162.0	131.7	91.0	1782.	weathered chert
Nonstationary Tools: Smoothed, Convex					
A16990	137.7	86.0	68.5	912.9	weathered chert
A4354	127.5	83.3	65.6	685.4	weathered chert
A35946	113.4	87.1	73.4	753.6	weathered chert
A44129	110.4	84.3	45.9	415.5	weathered chert
A44199	120.2	82.7	50.0	556.0	weathered chert
FN2008	154.4	90.1	80.7	1168.	weathered chert
Nonstationary Tools: Smoothed, Concave					
A44197	69.0	52.6	30.2	82.2	sandstone
A44117	-	-	14.1	16.6	sandstone
Nonstationary Tools: Battered, Convex					
A35779	60.1	37.6	35.4	113.6	quartzite
A13999	87.1	66.3	51.3	298.4	Florence B chert
A12763	96.9	61.3	53.9	324.1	weathered chert

Table C.7. (cont.)

Catalog Number	Length (mm)	Width (mm)	Thickness (mm)	Weight (gm)	Raw Material
Unidentifiable Smoothed Fragments					
A12834	-	-	-	33.4	weathered chert
A15764	-	-	-	56.2	weathered chert
A16778	-	-	-	53.5	weathered chert
A35763	-	-	-	23.3	weathered chert
A15763	-	-	-	6.9	weathered chert
FN1070	-	-	-	12.2	quartzite

APPENDIX D

FAUNA

Table D.1. Identified faunal elements recovered from 14BU25.

Cat. No.	Taxon		Element	Burned	Spiral Fracture
A13732	*Antilocapra*	*americana*	lumbar vertebra	-	-
A15379	"	"	R. distal humerus	-	+
A15477	"	"	L. proximal ulna	-	-
A4343	"	"	R. proximal radiul	-	+
A16077	"	"	R. radial carpal	-	-
A16306	"	"	R. fused 2 & 3 carpal	-	-
A44035-2	"	"	L. radial carpal	-	-
A36784	"	"	R. proximal femur	-	+
A15027	"	"	L. acetabulum (pelvis)	-	+
A12836	"	"	proximal femur (? side)	-	-
A14807	"	"	R. calcaneus	-	-
A4989/A4822	"	"	R. calcaneus	-	-
A4369	"	"	L. astragalus	-	-
A44035-1	"	"	L. lateral malleolus	-	-
FN1596	"	"	R. distal metatarsal	-	-
A44035-6	"	"	3rd phalanx	+	-
FN1493	"	"	1st plalanx	+	+
A12856	"	"	distal sesamoid	+	-
A44035-3	"	"	R. mandibular condyle	-	-
A4377	"	"	L. P_4	-	N.A.
A36773	"	"	R. M_2	-	N.A.
A44135	"	"	R. M_2	-	N.A.
A44079	"	"	R. M_3 fragment	-	N.A.
FN1266	"	"	M_3 fragment (? side)	-	N.A.
A44035-8	"	"	L. M^1	-	N.A.
A44034-2	"	"	R. M^2	-	N.A.
A16324	"	"	R. M^3	-	N.A.
A44028	"	"	R. M^3	-	N.A.
FN2007	"	"	R. M^3	-	N.A.
A13689	"	"	R. upper molar fragment	-	N.A.
A36003	"	"	L. upper molar fragment	-	N.A.
A44230	"	"	upper molar fragments	-	N.A.
A44168	"	"	upper molar fragments	-	N.A.
A44131-1	"	"	upper molar fragment	-	N.A.
A37079	"	"	lower molar fragment	-	N.A.
A44167	"	"	molar fragment	-	N.A.
A44131-1	"	"	molar fragment	-	N.A.
A15181	"	"	molar fragment	-	N.A.
A13894	"	"	molar fragment	-	N.A.
A44035-7	"	"	molar fragment	-	N.A.
A15713	"	"	molar fragment	-	N.A.
A35880	"	"	molar fragment	-	N.A.
A44180-3,4,5	"	"	molar fragments	-	N.A.

Table D.1. (cont.)

Cat. No.	Taxon		Element	Burned	Spiral Fracture
A44180-1	Antilocarpa	americana	tooth fragment	-	N.A.
A44131-2	"	"	tooth fragment	-	N.A.
A44178	"	"	tooth fragment	-	N.A.
FN2010	"	"	tooth fragment	-	N.A.
A35498	"	"	tooth fragment	-	N.A.
A16539	"	"	tooth fragment	-	N.A.
A13971	"	"	tooth fragment	-	N.A.
A15479	"	"	tooth fragment	-	N.A.
A35477	"	"	tooth fragment	-	N.A.
A16904	"	"	tooth fragment	-	N.A.
A44230	"	"	tooth fragment	-	N.A.
A44167-1	"	"	tooth fragment	-	N.A.
A44135	"	"	tooth fragment	-	N.A.
A44130	"	"	tooth fragment	-	N.A.
A4983	"	"	tooth fragment	-	N.A.
A5000979-3	"	"	tooth fragment	-	N.A.
A4989	Odocoileus	sp.	R. proximal radius	-	+
A44034-1	"	"	R. proximal radius	-	+
A44012	"	"	R. calcaneus	-	-
A44135	"	"	3rd phalanx	-	-
A15406	"	"	R.I_1	-	N.A.
A4756	"	"	R.M^1	-	N.A.
A14297	"	"	R.M_1	-	N.A.
A14412	"	"	R.M_2	-	N.A.
A14413	"	"	R.M^3	-	N.A.
A12441	"	"	upper molar fragment	-	N.A.
A15482	"	"	tooth fragment	-	N.A.
FN938	"	"	tooth fragment	-	N.A.
FN2009	Artiodactyla: Odocoileus sp./ or A. americana		L. proximal scapula	-	-
A15474	"	"	rib	-	-
A44181	"	"	proximal radius (? side)	-	-
A44019	"	"	distal metapodial (? side)	-	-
A15485	"	"	distal metapodial (? side)	+	-
A44033	"	"	medial metapodial (? side)	+	-
FN1269	"	"	distal 1st phalanx	-	+
A4379-1	"	"	distal 1st phalanx	-	-
A16409	"	"	distal 1st phalanx	-	+
A15468	"	"	proximal 1st phalanx	-	+
A44043	"	"	distal phalanx	-	0
A44035-4	"	"	L. postzygopophysis	-	-
A5005	"	"	L. postzygopohhysis	-	-
A44038-4	Bison	bison	proximal scapula (? side)	-	-
A15804-1	"	"	R. proximal radius	-	+
A15804-2	"	"	R. distal ulna	-	+
A44080	"	"	medial metacarpal (? side)	-	-

Table D.1. (cont.)

Cat. No.	Taxon	Element	Burned	Spiral Fracture
A16039	Bison bison	L. ulnar carpal	-	-
A16040	" "	L. intermediate carpal	-	-
A44079	" "	L. radial carpal	-	-
A44134	" "	acetabulum fragment	-	+
A4843-1	" "	L. astragalus	-	-
A4843-2	" "	L. naviculo-cuboid	-	-
A4843-3	" "	L. calcaneus	-	-
A44041	" "	2nd phalanx	-	-
A44039	" "	2nd phalanx	-	-
A44038	" "	proximal 3rd phalanx	-	-
A14812	Cervus canadensis	tooth fragment	-	N.A.
A44167-1	" "	tooth fragment	-	N.A.
AA44167-2	" "	tooth fragment	-	N.A.
A15473	Lepus californicus	R. proximal femur	-	-
A15889	" "	1st phalanx (hind foot)	-	-
A14230	" "	L. maxilla fragment	-	-
A14567	" "	L. palatal fragment and P^4 and M^1	-	-
A14293	" "	L. palatal fragment	-	-
A36366	" "	R. I_1	-	N.A.
A44018	" "	R. P_3	-	N.A.
FN1580	" "	L. upper molar or premolar	-	N.A.
A36791	Sylvilagus floridanus	R. distal humerus	+	-
A14296	" "	L. calcaneus	-	-
A44132	" "	R. mandible fragment	-	-
A44210	Leporidae	lower tooth fragment	-	N.A.
A44178	"	R. lower tooth fragment	-	N.A.
A44035	"	R. lower tooth fragment	-	N.A.
A14810	"	L. upper tooth fragment	-	N.A.
A44038-1	Canis latrans/familiaris	L. pelvis	-	-
A36842	" " "	R. M_2	-	N.A.
A44040	Canis latrans	R. mandible fragment and P_4 and M_1	-	-
A12916	" "	L. M_1	-	N.A.
A35773	" "	R. M_1	-	N.A.
A12613	Vulpes fulva	1st phalanx (front foot)	-	-
A15487	Procyon lotor	R. proximal femur	+	-
A35480	" "	R. M_2	-	N.A.
A44130	Castor canadensis	L. P_4 and M_1	-	N.A.

Table D.1. (cont.)

Cat. No.	Taxon	Element	Burned	Spiral Fracture
A14240	Geomys bursarius	upper incisor	-	N.A.
Flotation F 3	Rodentia	incisor	-	N.A.
Flotation F 5	Microtinae	molar	-	N.A.
A4756	Terrepene ornata	peripheral carapace	-	-
A44167	" "	peripheral carapace	-	-
Flotation F 5	" "	peripheral carapace	-	-
Flotation F 5	" "	costal carapace	-	-
A15890	Testudinata	carapace	-	-
A12835	"	carapace	-	-
A4379	"	carapace	+	-
FN1599	"	carapace	+	-
A14426	"	carapace	-	-
A12847	"	carapace	-	-
A12843	"	carapace	-	-
A14298	"	carapace	-	-
Flotation				
F 3	"	carapace	+	-
F 5	"	carapace	-	-
F 5	"	carapace	-	-
F 5	"	carapace	+	-
A12849	Aves	digit II fragment	-	-
A36789	"	radius fragment	-	-
Flotation				
F 3	Pisces	vertebral centrum	+	-
F 3	"	vertebral centrum	-	-
F 3	"	vertebral centrum	-	-
F 3	"	vertebral centrum	-	-
F 3	"	vertebral centrum	-	-
F 5	"	vertebral centrum	-	-

+ = present; - = absent; 0 = indeterminate; N.A. = Not Applicable

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CHAPTER 4

THE SNYDER SITE (14BU9): PHASE III EXCAVATIONS

Cherie E. Haury and Gary R. Leaf

Introduction

Previous work at the Snyder site (Bastian 1969; Grosser 1970, 1973; Leaf in press) demonstrates the existence of at least one Woodland and more than three Archaic components spanning a period of more than 3,000 years. The 1979 field season at the site concentrated largely on exploring and studying the Archaic occupations. The problem orientation of the research focused on investigation of settlement and subsistence patterns (Leaf 1979), with a special emphasis on faunal procurement techniques (Haury in press), and the cultural stratigraphy of the multiple Archaic components.

The Archaic sequence was set forth based on excavations and testing (Grosser 1970, 1973, 1977). The Butler phase Woodland component and the late Archaic Walnut phase component were stratigraphically separated by 25-30 cm. of yellow-brown clay. The Archaic occupation, estimated at 900 B.C. to A.D. 1, was represented by a variety of small, triangular, corner-notched and larger corner-notched or stemmed projectile points, the butchered remains of deer and bison, and four excavated hearths. Artifact density was light, scattered throughout a soil zone 40 cm. thick.

Stratigraphically below the Walnut phase component was the El Dorado phase component, estimated to date from 1900-1100 B.C. This component is represented by a large sample of artifacts which include: stemmed lancolate projectile points, bifaces, scrapers, drills, choppers, hammerstones, grinding stones, burned earth and daub, limestone and an abundance of floral and faunal remains. Excavated features were reported as hearths, postmolds, storage pits, and a human burial.

The Chelsea phase component underlies this. It is estimated to date at 2700-2000 B.C. This phase was separated from the overlying El Dorado phase on the basis of projectile point morphology. The points are short, broad bladed, had a marked shoulder and an expanded base. Other artifacts associated with these levels are knives, choppers, a drill, grind stones, remains of deer, bison, antelope, rabbit, raccoon, and box turtle, and charred walnut and chenopod remains.

The possibility of at least one and perhaps more prehistoric components below the Chelsea phase levels was raised when a deep backhoe trench cut through portions of the Snyder site exposed a concentration of burned limestone 250 cm. below the ground surface. Stratigraphy within the trench indicated that there is 100 cm. of culturally sterile soil separating this feature from those associated with the Chelsea phase.

Research Problems

Present data suggest (Grosser 1970, 1977) that during Archaic occupations of Snyder, there were significant shifts in the various subsistence economies. The number of plant and animal species used for food is small in the Chelsea phase component, large in the El Dorado component, and small again in the Walnut phase component. This oscillation from species specialization, to diversification, and back to specialization was explained in terms of cultural response to climatic and ecosystem changes. However, the food resource exploitation shifts may also be related to sampling inadequacies, changes in food preferences, preservation differentials, the functional differences already posited among components, changes in procurement strategies, seasonal variation, technological change, or any number of other factors. In short, there is a plethora of alternative hypotheses which may account for the observed numerical oscillation of food resources, none of which have been entertained, but all of which must be systematically tested. For example, artifact sample sizes retrieved from the three Archaic components, during previous excavations, vary greatly in size; the largest was obtained from the El Dorado component and the smallest samples came from the Chelsea and Walnut phase components. One may ask if the proposed food resource oscillation is a function of sample size variation; it is, clearly, quite possible since that component which contained the greatest number of identified food species also produced the largest artifact sample (i.e., El Dorado phase), whereas the Walnut and Chelsea phase components yielded the smallest samples of food items and artifacts. Small artifact samples from all but one of the site's components constitute the principal warrant for continued excavation. Larger sample sizes are not a panacea for addressing many other equally important substantive and theoretical problems posed by the cultural sequence at Snyder, but they are a necessary basis from which to start.

Hypothesis testing and the recovery of larger artifact and feature samples from the Archaic deposits were the major emphases of the 1979 field season at Snyder. The project-wide problem set which focuses on prehistoric subsistence and settlement systems (Leaf 1979) and a battery of site specific problems guided the implementation of a block excavation used to sample the Archaic deposits. Site specific problems included testing all of the conclusions offered by previous investigations (Grosser 1970, 1977) and summarized above. In particular, there was a concerted attempt to replicate findings related to the structure of the site's natural and cultural stratigraphy, and to expand knowledge of those domains of analysis. A reanalysis of faunal remains retrieved from the El Dorado phase component in the early 1970's (Haury 1980) suggested that Archaic people residing at Snyder at that time utilized a single kill, heavy butchering strategy for procurement of large game animals, such as bison, deer and antelope. This hypothesized pattern contrasted markedly with small game procurement techniques wherein the entire small animal was transported to the site for processing and consumption. Evidence for disturbance and attrition of bone elements in the El Dorado phase deposits also suggested the possibility that there was frequent utilization of butchered by-products which resulted in the destruction of various bone elements and that such bone waste was systematically discarded as garbage. Comparable analyses of

the archeofaunas recovered from the other Archaic components can help test some of these hypotheses. Furthermore, if substantiated, these propositions about the nature of Archaic subsistence economy have a number of implications concerning seasonality of site occupation, component functions within their respective settlement systems, and the adaptation of Arch ic populations to the regional ecosystem.

Site Description

The Snyder site, 14BU9, is located in the southern third of the El Dorado Lake project near meanders on the west (right) side of the Walnut River approximately 1.6 km. upstream from the mouth of Satchel Creek (Fig. 1). There are several other prehistoric sites in the immediate area; all of the sites illustrated in Figure 3.1, including Snyder, will be completely inundated by the lake's multipurpose pool. A small but permanent stream, which heads at a spring 1.2 km. northwest, currently flows through the site (Fig. 2). Site boundaries between the spring-fed stream and the Walnut River are based on surface collection sweeps; boundaries drawn for the area between the stream and railroad tracks are estimated. A test excavation placed in subarea D in 1978 demonstrated the presence of prehistoric artifacts on the west side of the spring-fed stream, but it is not known how much area is included.

The eastern portion of 14BU9 (subareas A, B, C) covers 6.8 ha. of land; this surface area measurement, based on Woodland surface debris, is too small since it does not include subarea D and an undetermined amount of cultural deposit eroded away by the Walnut River in the extreme northeastern site area (Fig. 2). Subareas B and C lie on the river's present flood-plain surface; subarea A delimits the extent of debris scattered on the surface of the river's first terrace, and subarea D represents the surface of what is probably the Walnut's second terrace. The details of relief and differential surface debris concentration in the eastern part of the site are related to the past behavior of the spring-fed stream which cut at least two paleochannels through Snyder and which presently flows in a channel along the contact between the Walnut's first and second terraces. Relief in subarea D is related to colluvium washed in from the uplands along the valley's edge to the immediate west and deposited on top of the second terrace formation. Previous archeological investigations on 14BU9 have demonstrated the existence of at least one Woodland component on or near the surface of subareas A, B, C and probably D; and more than three Archaic components buried within the first terrace in subarea A, but not in the other three subareas (Bastian 1969; Grosser 1970, 1977, 1973; Leaf n.d.). A more detailed description of the site, its immediate environs, and aspects of surface soils and topography can be found in Leaf (1980).

Excavation and Field Techniques

All previous excavations and tests were conducted in the area above the second step (subarea A). Since this is the area from which came the

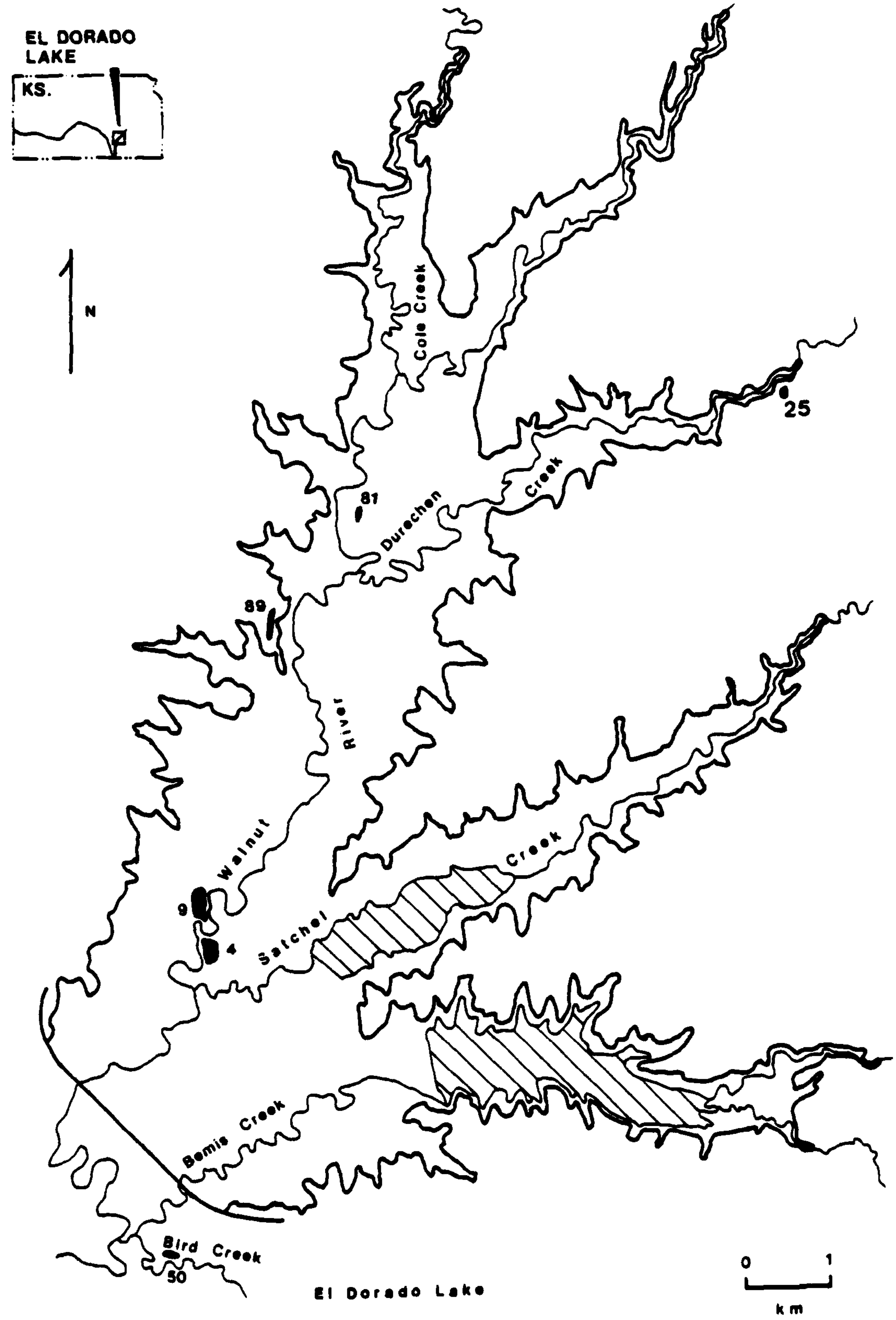


Figure 4.1. Location of 14BU9 and other Late Archaic sites within the El Dorado Lake area. (The 14BU-prefix is omitted from site numbers.

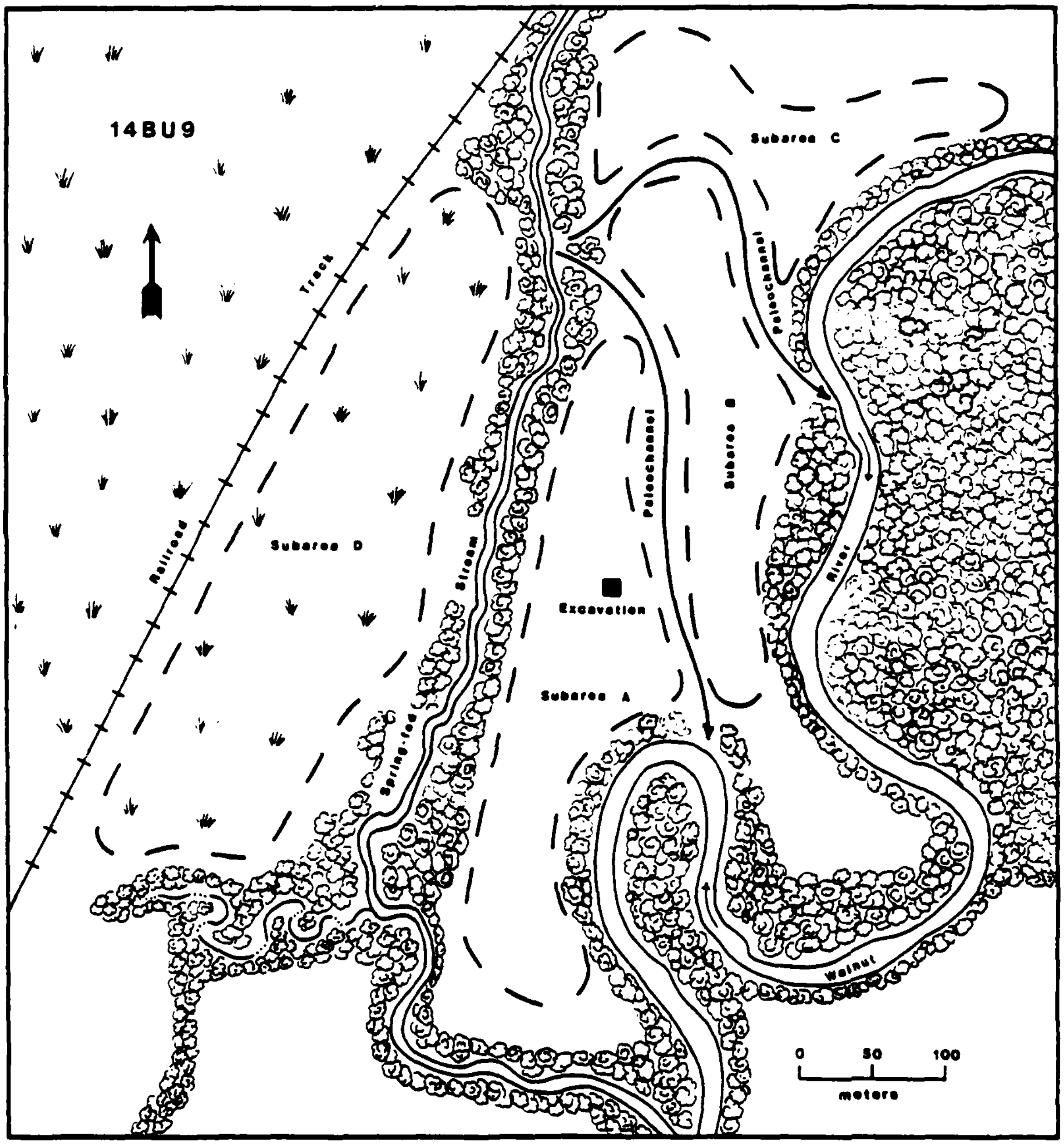


Figure 4.2. Site area, 14BU9.

information that guided the problem orientation and since there is no evidence in this area of fluvial disturbance, it was selected to be the site of the 1978 block excavation (Leaf:in press) (Fig. 3). An area of 25 square meters lying within the 100 sq. meter area was designated for the deep 1979 excavation. The size of the area was restricted because expected artifact density and depth of the excavation would require time to dig with the care attendant to accurate data collection. The 1979 excavations were taken down 13 levels to 140 cm. below the ground surface.

The area contains 25 1 x 1 meter squares, each identified by the grid co-ordinates describing the southeast corner. To facilitate study of the complex cultural stratigraphy and the relationships of artifacts, each square was excavated with hand tools, shovels and trowels, in 10 cm. levels. Tools, tool fragments, identifiable bone, and all artifacts greater than 2 cm. in any dimension were plotted three dimensionally. Backdirt was sifted through ¼ inch mesh screen to recover small artifacts which otherwise might not have been observed. Half-bushel soil samples were reserved from each level of each square so that a sample of micro-artifacts, flora, and fauna could be obtained by means of water flotation. Floors and walls of each excavation unit were trowelled smooth and examined for evidence of man-made features and changes in natural stratigraphy.

Natural and Cultural Stratigraphy

Grosser (1970, 1973) recorded four natural stratigraphic levels which were designated A, B, C, and D. The 1978 and 1979 excavations uncovered similar stratigraphy (Fig. 3). The plowzone, Ap, varied in depth from 18 to 21 cm., but averaged 19 cm.; it is a friable, silty clay loam, dark grayish brown (10YR 4/2, moist) in color. The soil unit is intact below the plowzone in some places. The intact portion apparently becomes progressively thicker to the west and south of the excavation block. This unit, A, contains undisturbed Woodland deposits (Leaf:in press; Bastian 1969). Extending to approximately 48 cm. below the surface, in some places directly below the plowzone and in others below unit A, is a mottled, dark yellowish brown (10YR 4/6, moist), friable, fine-textured, silty clay. This unit was almost devoid of cultural debris and seems to be the same as the "sterile" zone discussed by Bastian (1969) and Grosser (1970, 1973) which stratigraphically separates the site's Woodland deposit from underlying Archaic deposits. Soil analyses suggest that this unit represents a period of rapid deposition of sediments (Artz 1980).

At approximately 48-50 cm. below ground surface, underlying the yellow Bt zone, is the buried A horizon of a paleosol. This is visible as a dark gray (10YR 3/2, moist) band of heavily mottled silt loam (Artz 1980). The lighter colored (10YR 3/3, moist) B horizon of the paleosol can be observed at around 100 cm. below surface. This paleosol has been documented at 14BU4, 14BU87, 14BU25 and in a small upland drainage feeding Gilmore branch, a tributary of Cole Creek. Archaic cultural remains occur throughout the paleosol at the Snyder site.

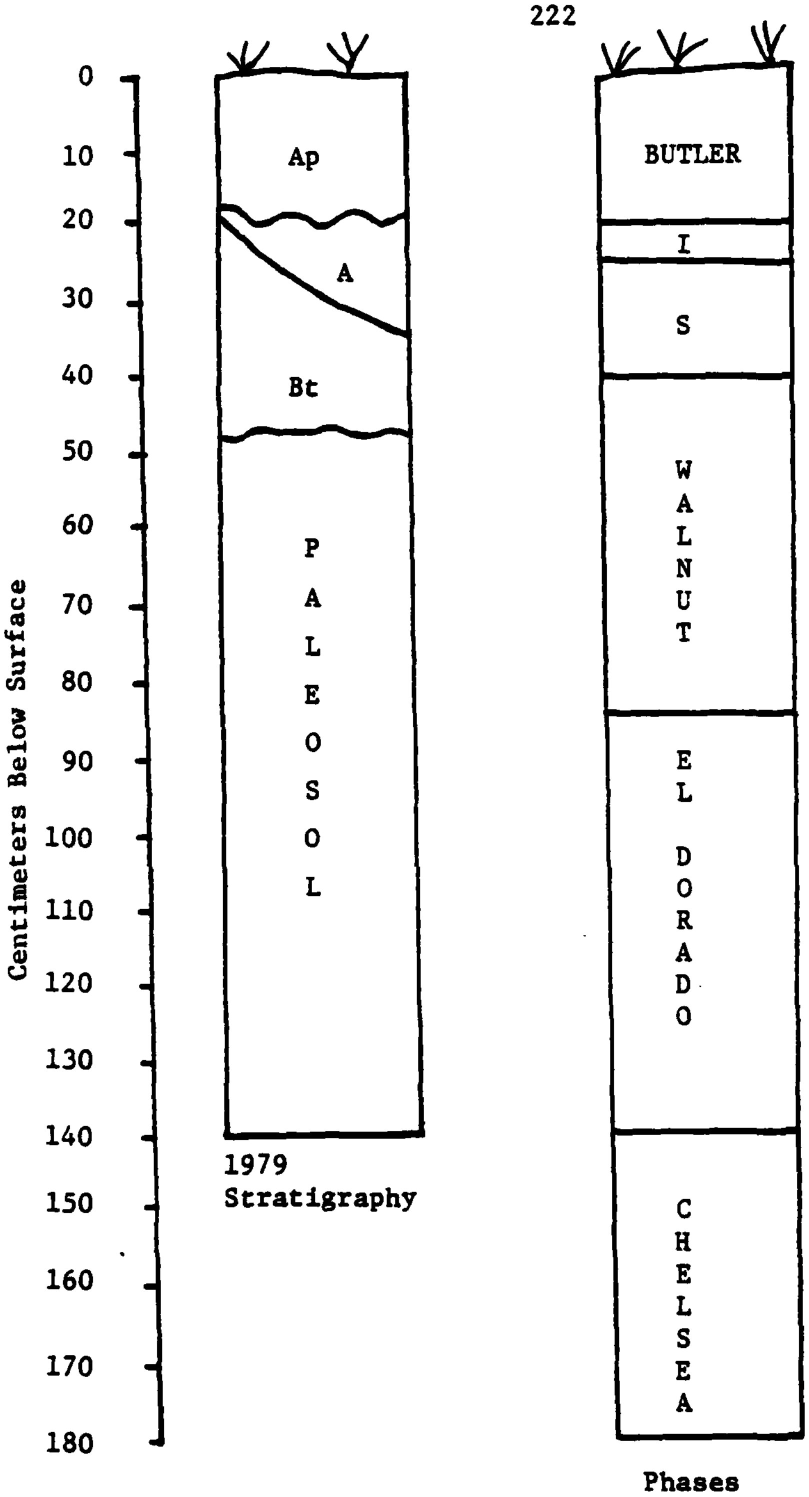


Figure 4.3. Stylized summary of the natural and cultural stratigraphy at 14BU9.

The cultural stratigraphy in the 1979 excavations, however, did not conform to predicted patterns. Artifact densities of three occupational phases should logically stand out on a distribution graph. Figures 4-11 illustrate that, in the case of the 1979 excavation block, this is not the case. These artifact distributions show two wide, but distinct peaks. One around 20-50 cm. below surface and the second, which is not as narrowly defined as the first, ranges between 90-130 cms. below surface. The expected peak between 50-90 cms. below surface for the Walnut phase materials is absent. Hypothesized reasons for the dissimilarity of cultural stratigraphy include (1) variation in artifact distribution vertically and horizontally as a result of cultural occupation patterns; or (2) variation as a result of post-depositional factors such as preservation or displacement processes.

The question of why there is such a distinct variation in the cultural stratigraphy of two excavations placed within 10 m. of each other is an important one. Addressing the artifact analyses to the proposed hypotheses may shed light on the problem of settlement patterns and/or further our understanding of the post-depositional processes which blur and confuse cultural stratigraphy.

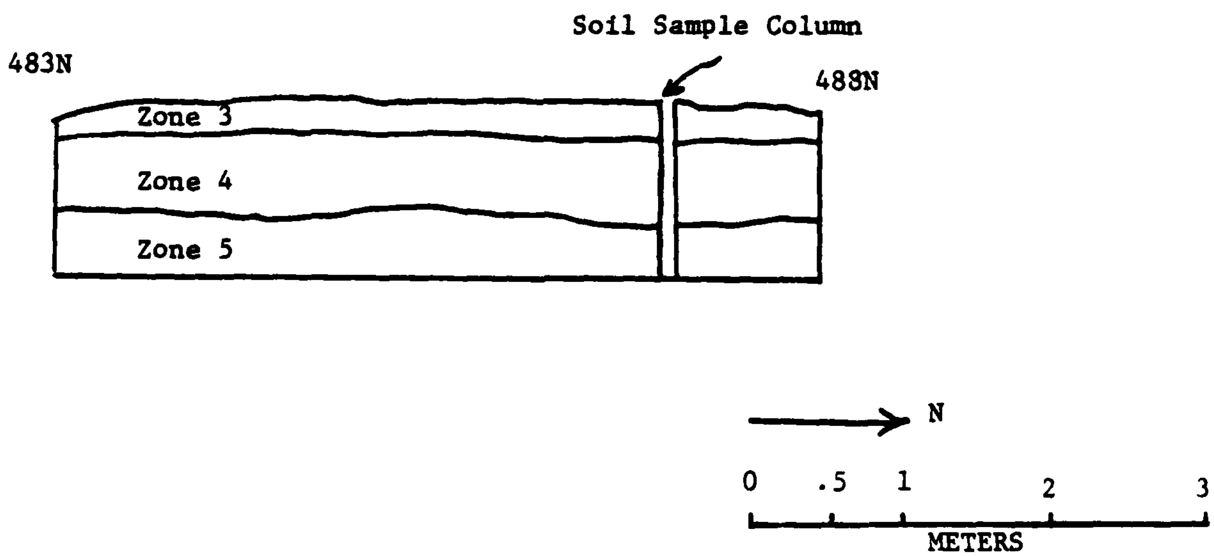


Figure 4.4. West wall profile at 14BU9. Zone 3, B1 horizon: 10YR 4/4 moist, with massive blocky structure. Zone 4, B_2t horizon: 10YR 3/2 moist, with massive blocky structure. Zone 5, B_3 horizon: 10YR 3/3 moist, with blocky structure.

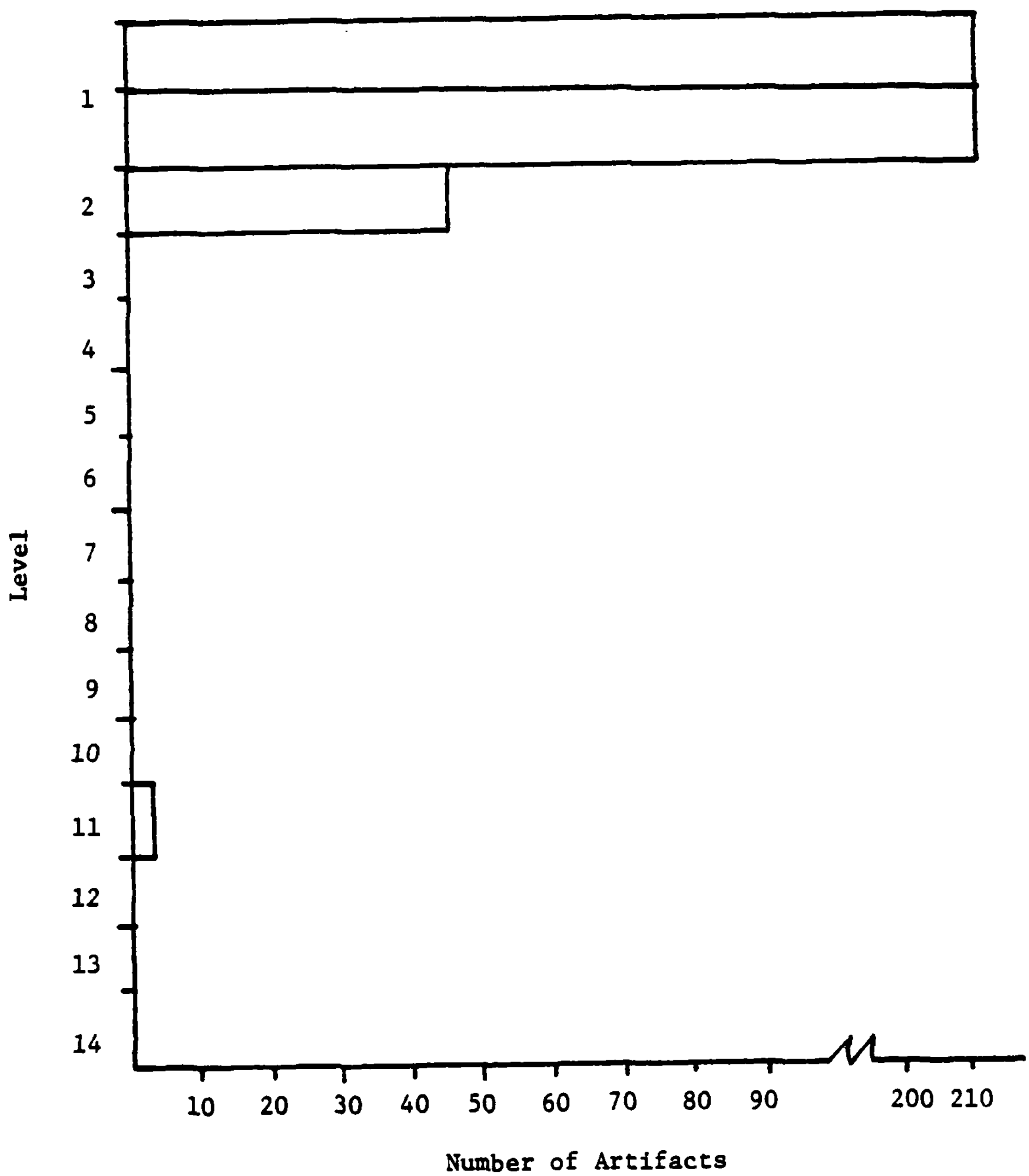


Figure 4.5. Vertical distribution of historic artifacts found in the 1978-1979 excavations.

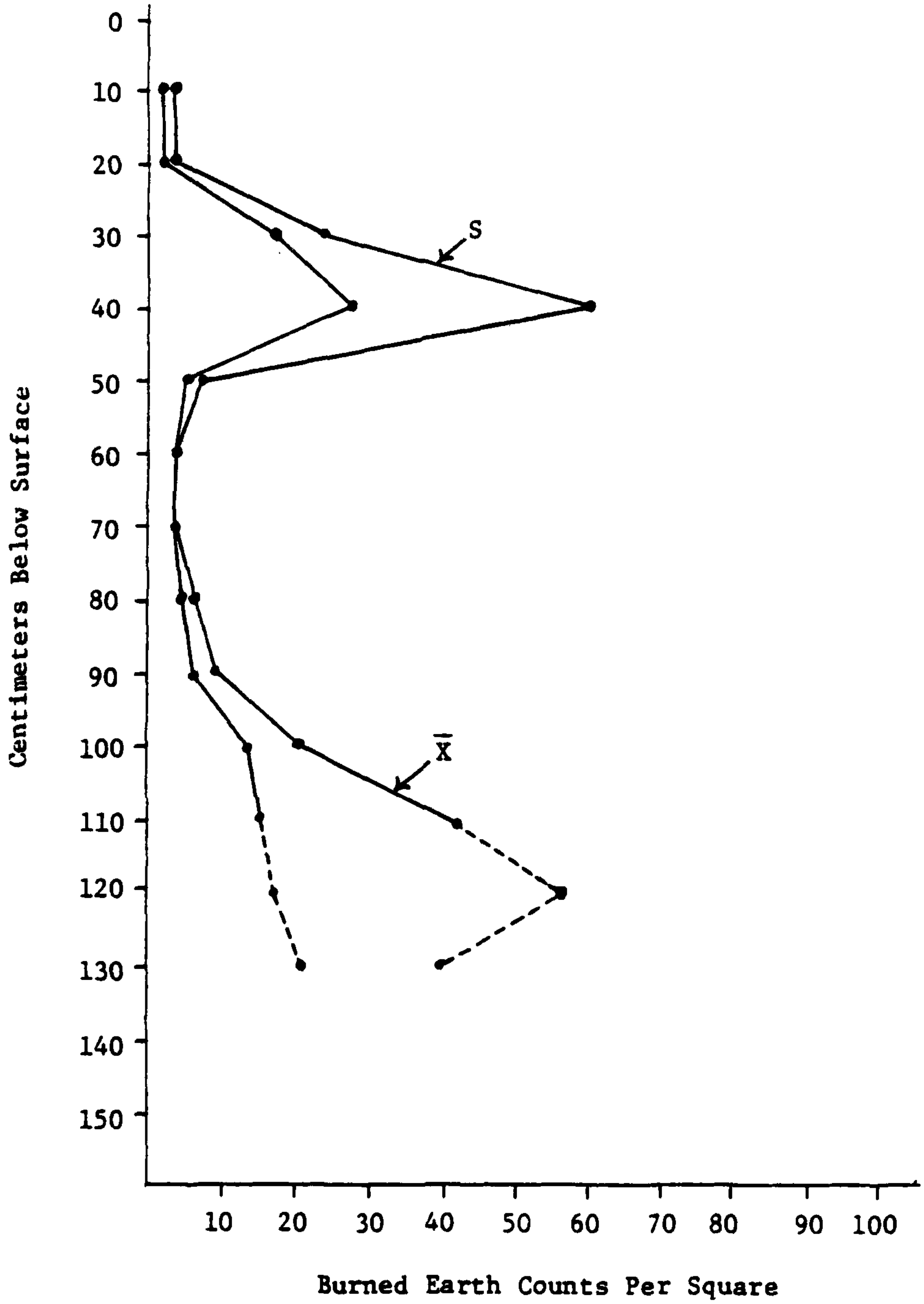


Figure 4.6. Vertical distribution of burned earth.

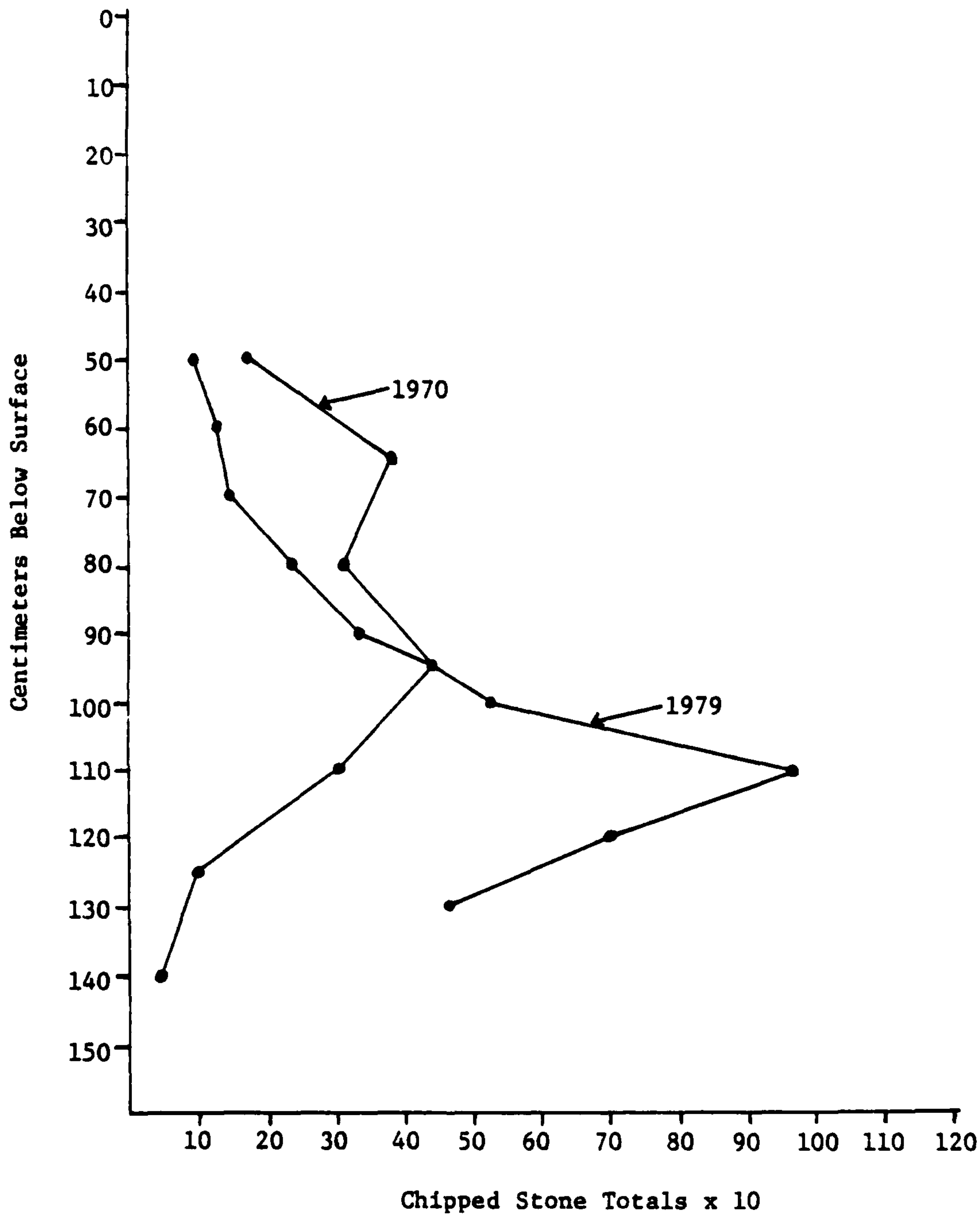


Figure 4.7. Vertical distribution of chipped stone.

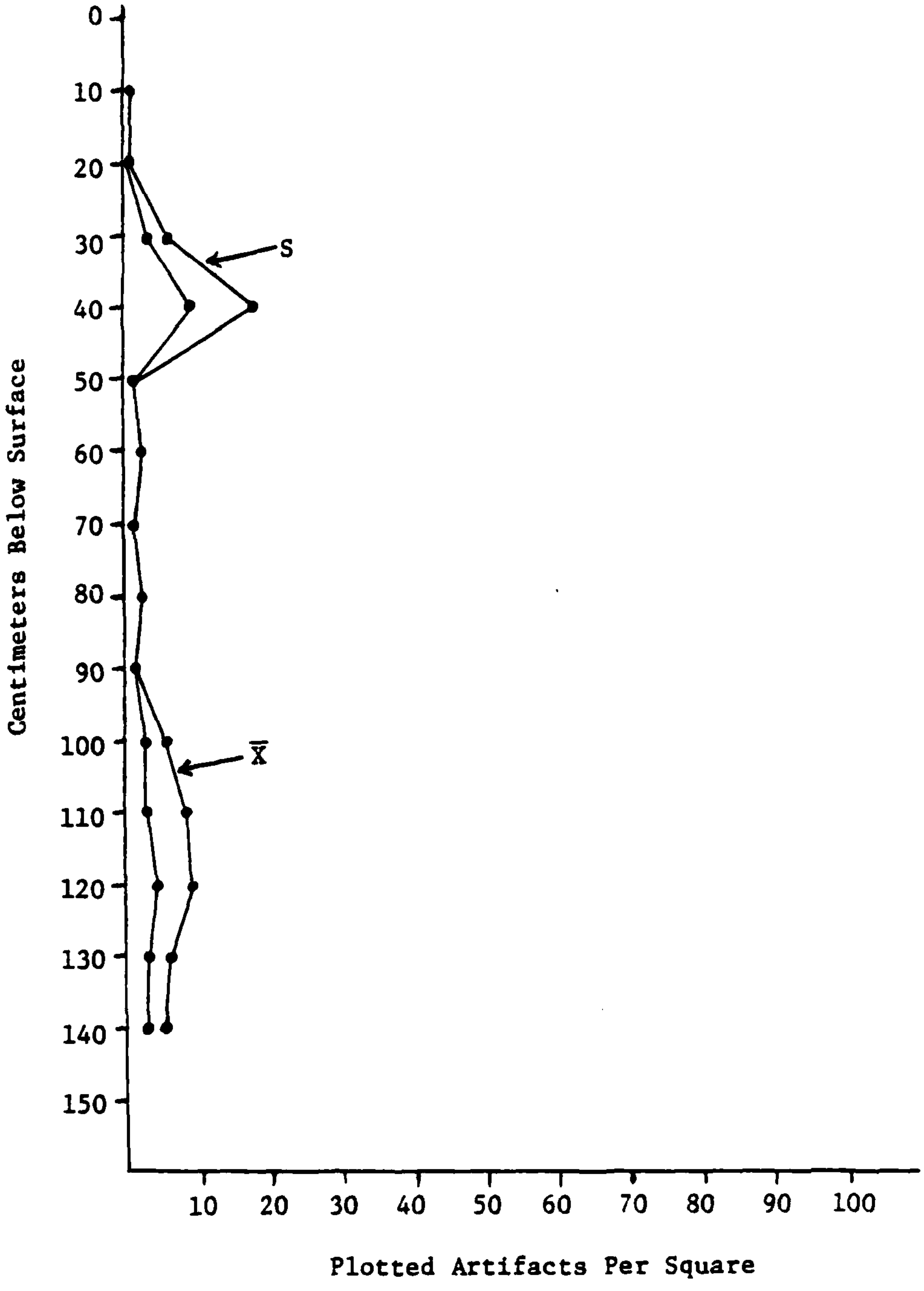


Figure 4.8. Vertical distribution of plotted artifacts.

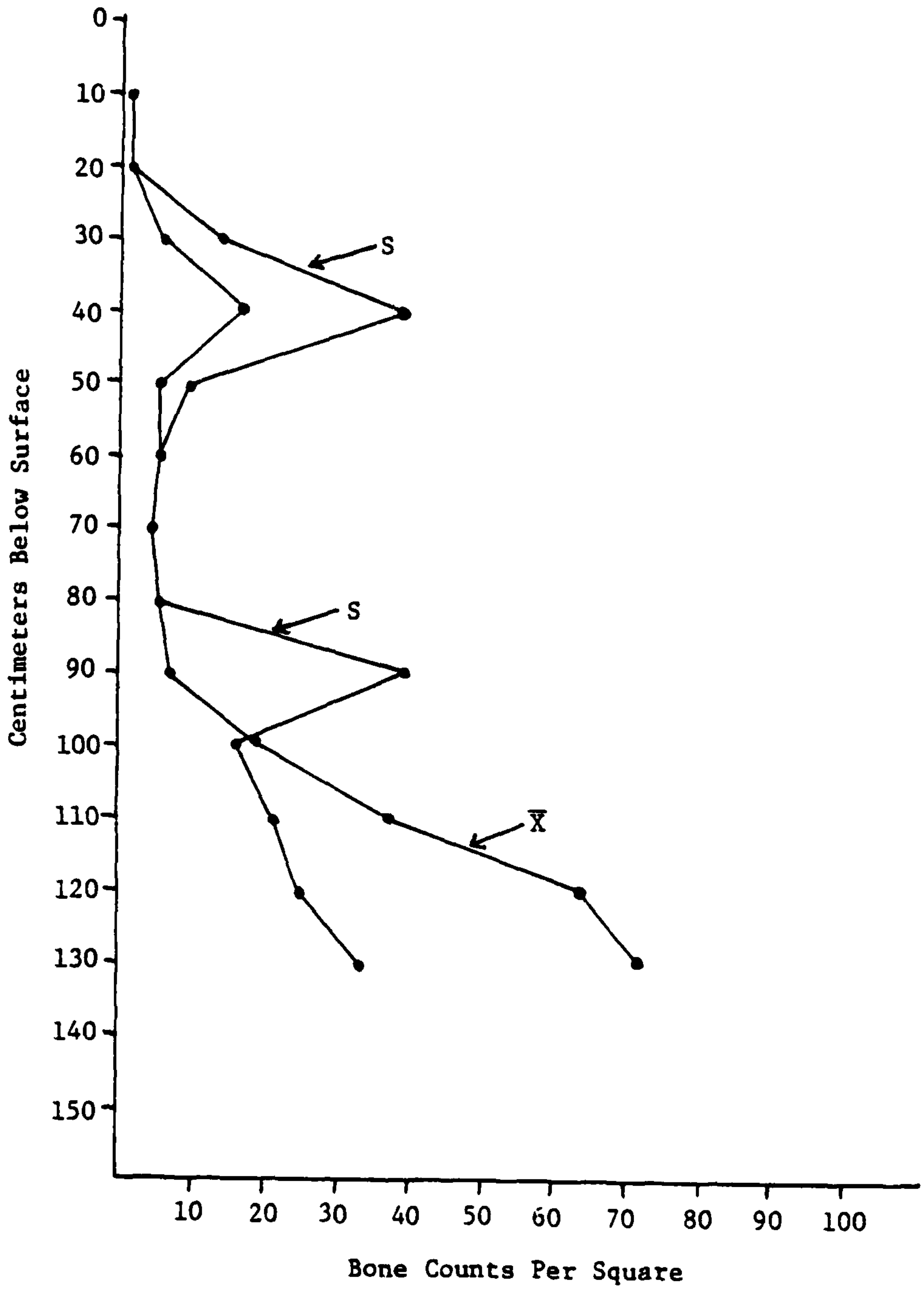


Figure 4.9. Vertical distribution of bone.

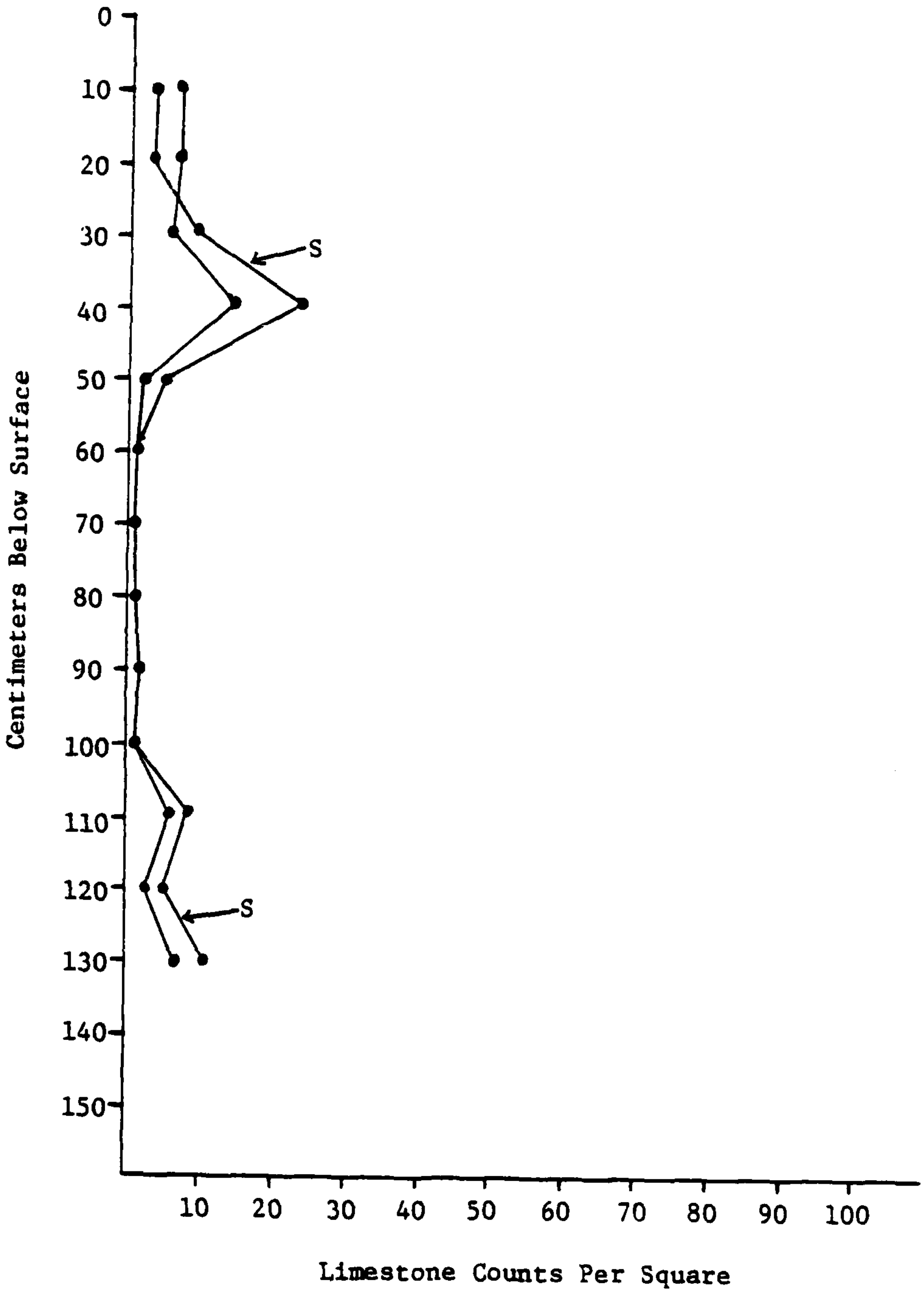


Figure 4.10. Vertical distribution of limestone.

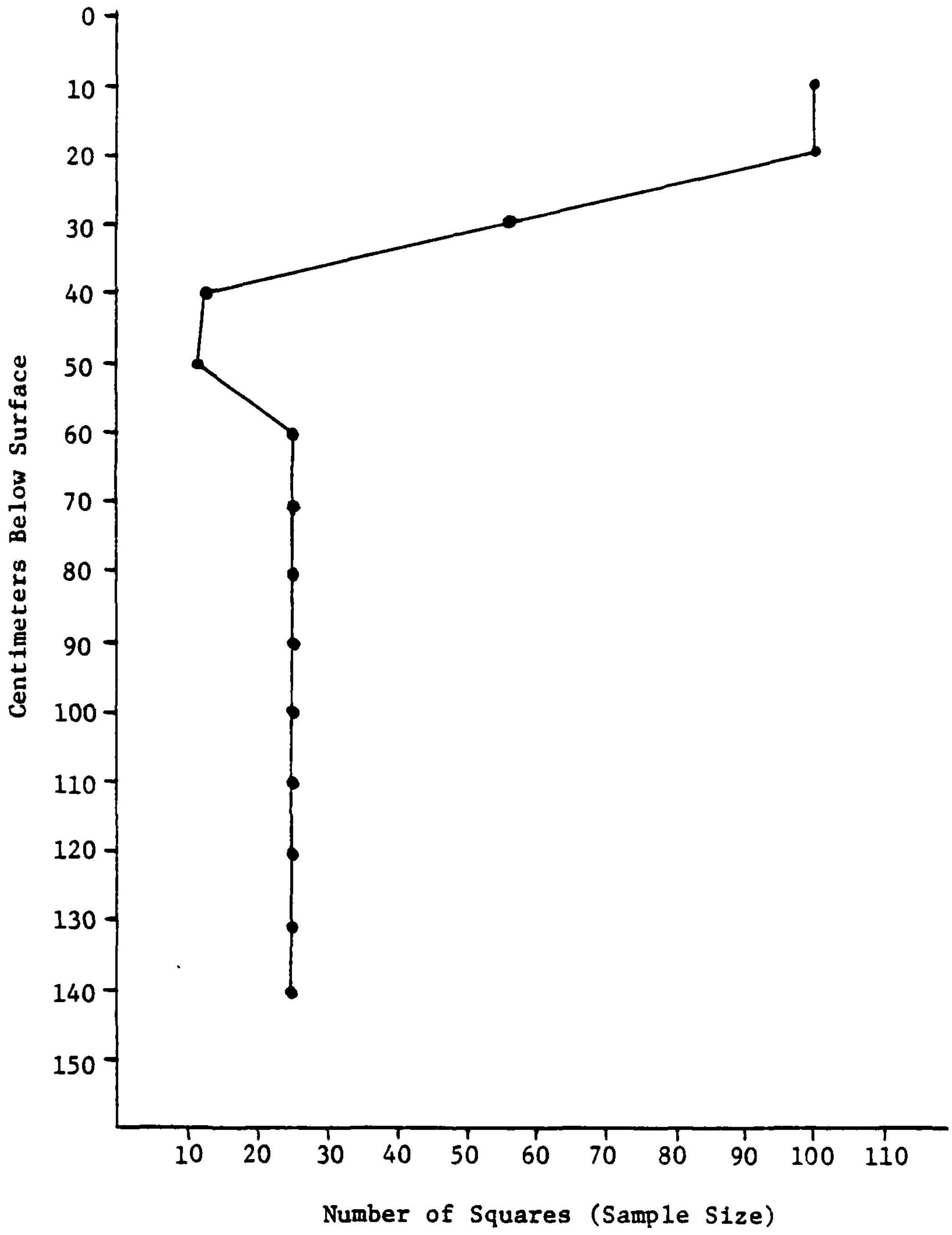


Figure 4.11. Vertical sample size distribution.

Soil Disturbance

The hypotheses proposed above imply the following explanations for the dissimilarity between the 1970 and the 1979 cultural stratigraphy. The Walnut phase component detected in the earlier excavations may have been a product of site disturbance processes which relocate artifacts along a vertical plane. The alternative explanation is that, if the Walnut phase component is present at the Snyder site, the 1979 excavation sampled an area of the site that did not include it or there was so little durable debris in that area that site disturbance processes masked its presence. These suggestions can be tested by examining the artifacts recovered from the excavation. Since the excavation was not deep enough to have contacted the major portion of the Chelsea phase materials, study will be confined to the stratigraphy of the Walnut and El Dorado phases. If the Walnut phase is a product of site disturbance processes such as faunalturbation, cryoturbation, aquaturbation, argillturbation, floraturbation, etc., there should be no clear vertical distinction between artifact forms. That is, turbulence in the soil would have carried cultural materials from occupation levels above and below, therefore representative tool forms from both levels would be combined in intervening levels. Cross-mending artifacts which have vertical separation would provide the best support for this contention. Most of the disturbance processes mentioned above affect materials of specific size and shape. For example, aquaturbation or floodwashing tends to move lightweight and aerodynamically shaped objects and would completely remove floatable items like charcoal or charred flora; argillturbation (swelling and shrinking of clays) and cryoturbation (frost heaving) move small thin or elongate objects. The assemblage must be examined for vertical patterns of this nature. Horizontal patterning of artifact distribution must also be studied. If a cultural occupation existed in an area of extensive disturbance cultural features and spatial patterns might be blurred but still distinguishable. On the other hand, if the presence of the artifacts is the result of disturbances alone, such patterns would not be observable and cultural features would be absent. Instead, artifacts would cluster around natural features such as tree root molds, rodent burrows, or low surface forms. Finally, faunal remains must be examined for evidence of intrusive animal forms or cultural butchering and processing.

Throughout the Snyder site, evidence of disturbance is common. Rodent runs, detectable as dark, elongate stains which exhibit abrupt turns or expand into chambers, are the most common soil feature observed in the excavation. The common occurrence of *Microtus* (vole) and *Scalopus* (mole) remains along with those of a number of other small burrowing creatures is strong evidence that these animals have been rearranging the materials at the site, probably since the time of its occupation.

It seems clear that at least some of the objects in the excavation have been displaced. Leaf (in press) discusses the presence of a few scattered artifacts of Archaic and post-Archaic styles in the Bt soil horizon reported as sterile by Bastian (1969) and Grosser (1970, 1973, 1977). It has been suggested that this soil unit was the product of rapid deposition; therefore, it was probably not stable enough to support an occupation of any duration. It appears that the artifacts found in this unit are the result

of disturbance processes. The clearest indication of movement of artifacts at this site is the presence of historic artifacts in levels radiocarbon dated as prehistoric; most significantly, fragments of brick were found as far as 110-120 cm. below the surface.

Artifact Descriptions

Obtaining an understanding of both the cultural stratigraphy and the cultural activities represented in the remains recovered from this excavation at the Snyder site is best approached by examination of the cultural materials. The following analysis will be based on raw material categories and type of cultural manipulation. This is done for the following reasons: (1) different materials deteriorate at different rates; (2) as a result of variations in utilization and natural properties, artifacts will be of different shapes and sizes so that disturbance processes will affect them differently; (3) utilization and disposal behavioral patterns will be reflected by each category depending upon its cultural role(s); (4) procurement strategies may also be analyzed through this approach. The material categories are chert (which appears as chipped stone tools and manufacturing debris or as rotted chert put to other uses), hematite, limonite, quartzite, sandstone, petrified wood, and osteological faunal remains. In addition, there must be some discussion of historical artifacts which have obvious implications for the study of cultural stratigraphy and disturbance processes.

Hematite

Table 1 is a level by level summary of hematite found in the excavation.

Table 4.1. Distribution and modification of hematite in the 1979 excavation at the Snyder site.

LEVEL	ROUNDED/SMOOTHED	CHIPPED	UNMODIFIED	TOTAL
5	2	0	0	2
6	0	0	4	4
7	2	0	5	7
8	0	0	8	8
9	1	0	0	1
10	0	0	2	2
11	3	0	2	5
12	0	0	0	0
13	1	0	0	1
TOTALS	9	0	21	30

Hematite is a compound of iron and oxygen (Fe_2O_3) which may be either red and earthy or black with a dull or metallic luster. Both types can be readily recognized by their brown or red-brown streak. The red variety occurs in surface rocks in Kansas, primarily scattered in clays and shales. Its most notable occurrence in Kansas is in the Dakota formation in the Smokey Hill region (Tolsted and Swineford 1977:46). It is soft and will stain objects rubbed. Consequently, it is an excellent source of red or red brown pigment. Smooth rounded surfaces, which may exhibit parallel striations, were found on approximately one-third of the pieces from the Snyder site. This attests to the fact that it was gathered and brought to the site for a purpose, possibly as a source of pigment for paint. The remaining two-thirds of the hematite from the site does not show cultural modification. This could be because evidence of use has been eroded away, or because it was not used. All of this material is probably imported into the Snyder site, since its occurrence is uncommon in the Flint Hills.

Limonite

Limonite is a mineral similar to hematite. It is a compound of iron, oxygen and water [$FeO(OH) \cdot nH_2O + Fe_2O_3 \cdot nH_2O$]. When combined with clay it is yellow ochre, which is soft and will easily color other objects. It is yellow-brown or dark brown in color. In Kansas, limonite is found in the Dakota formation and has been reported in Marion County, immediately northwest of Butler County (Tolsted and Swineford 1977:46). Table 2 summarizes the occurrence of limonite in the excavations. It is concentrated in the lower levels of the block, between 80-130 cm. below surface, and, unlike hematite is completely absent from the upper levels. Nearly all of the recovered pieces have been modified by rubbing or smoothing, and one piece from level 9 has a deep groove across its surface. Such evidence suggests that it was used as a source of pigment.

Table 4.2. Distribution and modification of limonite in the 1979 excavation at the Snyder site.

LEVEL	ROUNDED/SMOOTHED	CHIPPED	UNMODIFIED	TOTAL
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	3	0	0	3
9	1	0	1	2
10	0	0	0	0
11	1	0	0	1
12	3	0	0	3
13	4	0	0	4
TOTALS	12	0	1	13

Quartzite

Only one piece of culturally modified quartzite was recovered from the block. This brown artifact, weighing 112.8 g., has been smoothed or pecked on all surfaces. One surface has a residue of unknown nature adhering to it. This artifact is interpreted as a fragment of a mano. Quartzite occurs most abundantly in Kansas in the Kiowa shale and the Dakota sandstone in McPherson and Kearny Counties, and as a glacial erratic in northeastern Kansas (Tolstead and Swineford 1977:28). It is not restricted to these areas, however, and isolated pieces can be found scattered in several of the cherty limestone members in the Flint Hills.

Petrified Wood

One piece of petrified wood was found in the level between 80-90 cms. below surface. It has a rounded surface, a brown, waxy, patina, and is probably stream gravel. Although it is not culturally modified, the possibility remains that it was intentionally brought to the site since petrified wood is not common in this area. This view is supported by the fact that four, larger, pieces of petrified wood were collected at the site during earlier work in 1970.

Sandstone

Sandstone occurs in a majority of the levels of the excavation. Examination of Table 3 makes it clear that it is most numerous in the lower 40 cms., the greatest abundance occurring between 100-110 cm. below surface. The sandstone is yellow-brown or dark brown in color and cemented by a matrix high in iron oxide. Several of the samples recovered are friable, but most do not crumble easily. Approximately one-third of the sandstone

Table 4.3. Distribution and modification of sandstone artifacts in the Archaic levels of the Snyder site.

LEVEL	BURNED	WORKED	BURNED & WORKED	UNMODIFIED	TOTAL
5	0	0	0	1	1
6	0	0	0	1	1
7	0	0	0	0	0
8	0	0	0	0	0
9	2	0	0	0	2
10	5	0	3	4	12
11	0	1	0	5	6
12	3	2	0	1	6
13	0	0	0	1	1
TOTALS	10	3	3	13	29

has been exposed to heat intense enough to change it from its yellow-brown color to pink or red-brown. These color changes are the result of oxidation within the material which requires either fairly intense heat or a prolonged exposure to heat. Neither of these conditions is usually met by naturally-occurring grass fires; therefore, it seems likely that these specimens were heated by the site's occupants either intentionally or accidentally. Six sandstone artifacts have flattened surfaces, rounded edges and corners, and long, narrow grooves. This wear probably results from the use of the abrasive qualities of the stone, as for example, for arrow or spear shaft manufacture.

Discovering the possible sources of sandstone has proven a complicated problem. There are many extensive sandstone outcrops in western and south-central Kansas, and sandstone also occurs in channel deposits of Pennsylvanian age limestones in extreme south-eastern Kansas and western Missouri. Sandstone is also present in scattered lenses, interbedded with shale and limestone, in Lyon, Greenwood, Cowley, Chautauqua, and Chase Counties (Moore, Jewett, and O'Connor 1951; Bayne 1962; Tolsted and Swineford 1977; Zeller 1968). These are not extensive formations, and they have not been mapped geologically, but they are the nearest potential source. It cannot be determined at this time which of these sandstone sources are represented.

Rotted Chert

Chert is the most abundant lithic material at the site and can be subdivided into two groups, rotted chert and siliceous chert. Rotted is a term used to describe chert which has been completely desilicified through extensive weathering. This modification takes place as water trapped within the structure of the chert evaporates. The outgoing water takes silica with it, enlarging the pores. This process goes on very slowly but can eventually remove all the silica. The resulting rotted or desilicified nodules are coarse and porous (resembling basalt) and are usually stained dark brown or dirty gray (Fig. 13) (Shepherd 1972:109; Honea 1964:15). Such nodules occur in locally abundant scatters in the uplands between Bemis and Satchel Creeks and near Cole Creek,

Table 4 summarizes data concerning rotted chert from the excavation. Two lines of evidence suggest that all of this chert was intentionally brought to the site. First, the nodules are not found in the immediate area except in deposits which contain other cultural debris. Second, in areas where they do occur apart from cultural deposits, a majority are found as whole nodules. At 14BU9 all of the rotted chert is fragmentary; no whole nodules have been recovered. In fact, 180 of 252 (42%) have no original surfaces at all; in non-cultural deposits this is very unusual.

Twenty (7.9%) specimens in the collection have been worked by grinding and/or pecking on one or more surfaces, but their fragmentary condition makes it difficult to determine their function. The nature of the smoothing on the worked surfaces, however, suggests that they may have been abrading or grinding tools. At 14BU25, another Archaic site in the Walnut River

Table 4.4. Distribution and modification of rotted chert in the Archaic levels of the Snyder site.

LEVEL	BURNED	WORKED	BURNED & WORKED	NOT BURNED OR WORKED	TOTAL
5	15	0	0	8	23
6	5	0	0	1	6
7	9	0	0	4	13
8	0	1	0	6	7
9	22	0	1	13	36
10	31	3	6	25	65
11	12	3	3	26	44
12	13	1	0	30	44
13	6	1	1	6	14
TOTALS	113	9	11	119	252

drainage, complete or nearly complete manos made from rotted chert were recovered (Root 1980:118-120). Forty-nine percent (124 of 252) of the specimens have been burned, perhaps as hearthstones or boiling stones.

Chipped Stone Artifacts

Unweathered siliceous chert was used for the manufacture of chipped stone tools. By examining these artifacts in terms of technological class, it will be possible to obtain information on selection of materials and production and use of tools and to compare the vertical (temporal) variability in these technological data. Classes to be used in the analysis are: cores and core fragments, unifaces, bifaces, utilized flakes, debitage, and tested raw materials. Table 6 summarizes the verticle distribution of these materials by technological classes.

Tested Raw Materials

Tested raw material refers to a piece of chert, or some other kind of chippable stone, that has one fresh flake scar. Presumably a flake was removed to allow the knapper to determine better the quality of the material for reduction. Figure 12A shows the one artifact that was categorized as tested raw material. This piece was found between 50-60 cm. below surface (Table 5). It is tabular Florence A chert, and may have been collected from a residual deposit or directly from a bedrock source. The natural shape of the piece provided a flat surface which was used as a striking platform to remove a large, wide flake.

Cores

Table 6 summarizes data on cores. A core exhibits (1) more than one flake detachment scar, (2) one or more cleavage faces, and (3) one or more striking platforms. Core fragments are broken cores that exhibit at least one of the features listed above; in addition, they have one or more

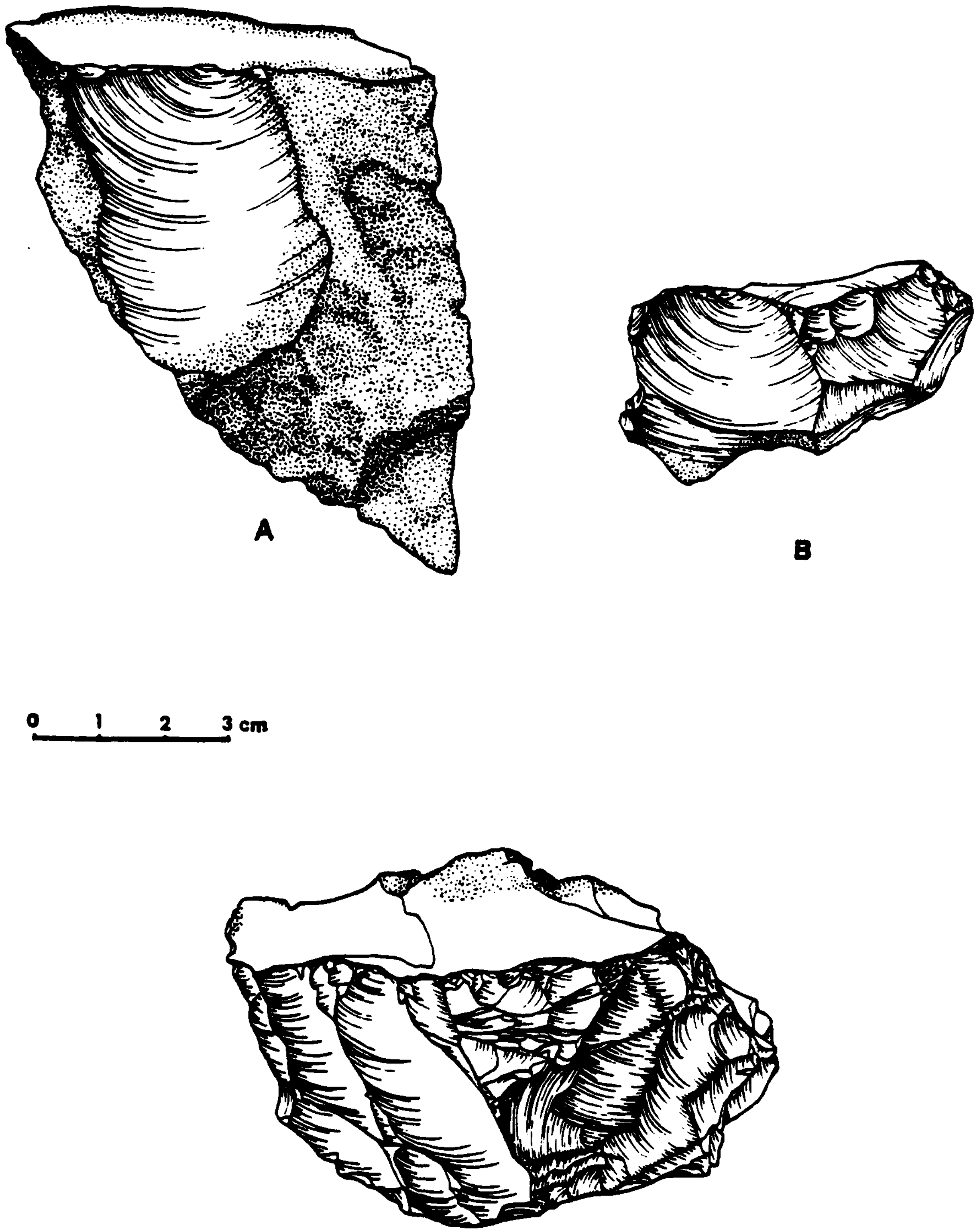


Figure 4.12. Tested raw material and examples of cores excavated at 14BU9.

Table 4.5. Technological classes of chipped stone materials recovered from each level at the Snyder site.

CLASS	LEVEL 5	6	7	8	9	10	11	12	13	TOTALS
CORES & FRAGMENTS	1	0	0	1	1	1	0	1	3	8
UNIFACES	2	0	1	0	2	0	1	1	1	8
BIFACES	1	2	0	2	11	15	5	5	8	49
UTILIZED FLAKES	0	0	0	0	1	0	0	0	0	1
DEBITAGE	129	146	226	330	521	796	567	379	213	3307
TESTED RAW MATERIALS	1	0	0	0	0	0	0	0	0	1
TOTALS	134	148	227	333	536	812	573	386	225	3374

Table 4.6. Summary of data related to the cores and core fragments from the Archaic levels of the Snyder site.

LEVEL cm. below surface	CORE TYPE	CHERT TYPE	HEAT TREATMENT	CHERT RESOURCE
50-60	single ended	Florence B	absent	indeterminate
80-90	polymorphic (fragment)	Cresswell	present	indeterminate
90-100	polymorhpic	Florence B	absent	river gravel
100-110	polymorphic (fragment)	Cresswell	present	indeterminate
120-130	polymorphic	Florence B	absent	indeterminate
130-140	polymorphic (fragment)	Light Gray	absent	river gravel
	polymorphic	Light Gray	absent	river gravel
	polymorphic	Cresswell	present	indeterminate

freshly broken surfaces that do not exhibit the features of a flake's ventral surface (Leaf 1979:96). Different types of cores are defined on the basis of the number of striking platforms and cleavage faces they exhibit, as well as the spatial relationships both have vis-a-vis each other (cf. White 1963). Polymorphic cores have randomly placed flake scars each of which may have its own individual striking platform. Single-ended cores have one striking platform and one or more cleavage faces; double-ended cores have two striking platforms opposite each other and may exhibit one or more cleavage faces. Bipolar cores have two surfaces of percussion at opposite ends of a striking axis; one is the striking platform and one is the base. The base exhibits crushing and small flake scars (Leaf 1979:96, Fig. 4.10:97). Discoidal cores are distinguished by two roughly circular cleavage faces that intersect at the core's midline. Each cleavage face served as the striking platform for the other detachment face. A core nucleus is the minimum size below which usable flakes can no longer be removed. Site specific analysis is necessary to make this determination.

One core was found in each of four levels, and three cores were found in Level 13 (130-140 cm. below surface). In Level 5 (50-60 cm. B.S.) a single-ended core made from half of a nodule of Florence B chert was found (Fig. 12B). The core is approximately pyramidal, with the widest portion the striking platform. A polymorphic core fragment, made from heat-treated Cresswell chert, came from between 80-90 cm. B.S. It is small and blocky and may be a core nucleus as suggested by small flake scars. Maximum width of the flake scars is only 29.5 mm. (Fig. 12C). The source of the chert is probably a local residual deposit or bedrock exposure.

Figure 13A illustrates a core made from a piece of Florence B chert procured from a river gravel deposit. This specimen was found between 90-100 cm. B.S. One portion of the surface is battered; however, because this is river gravel it is impossible to determine whether or not the battery was natural or resulted from cultural manipulations. Another blocky core fragment of Florence B chert (Fig. 13B) was found in level 12 (120-130 cm. B.S.). Flake scars appear on every surface, struck from all directions, but the origins of most are gone. Two cores and one core fragment were recovered from 130-140 cm. below surface. All three are blocky, angular and polymorphic. One core and the fragment were manufactured from river gravel of Flint Hills light gray chert. The third is a piece of heat-treated Cresswell chert. All evidence of the original surface is gone from this specimen so it is not possible to determine the source of the raw material.

Core sample size and distribution does not present a clear pattern, but it can be observed that: (1) polymorphic cores are by far most common, which is a frequent pattern in the area (Leaf 1979:98, 128, 149, 182), (2) only Cresswell appears to have been heat treated prior to core reduction, and (3) river gravel was at least one of the local sources from which raw materials were procured for core manufacture. There are two possible explanations for the absence of cores made from non-local cherts: (1) the non-local cherts which appear as tools in the assemblage were brought to the site as preforms or as completed tools, or (2) if non-local materials were brought to the site as cores they may have been more extensively utilized and curated, rendering them uncommon in the archaeological record.

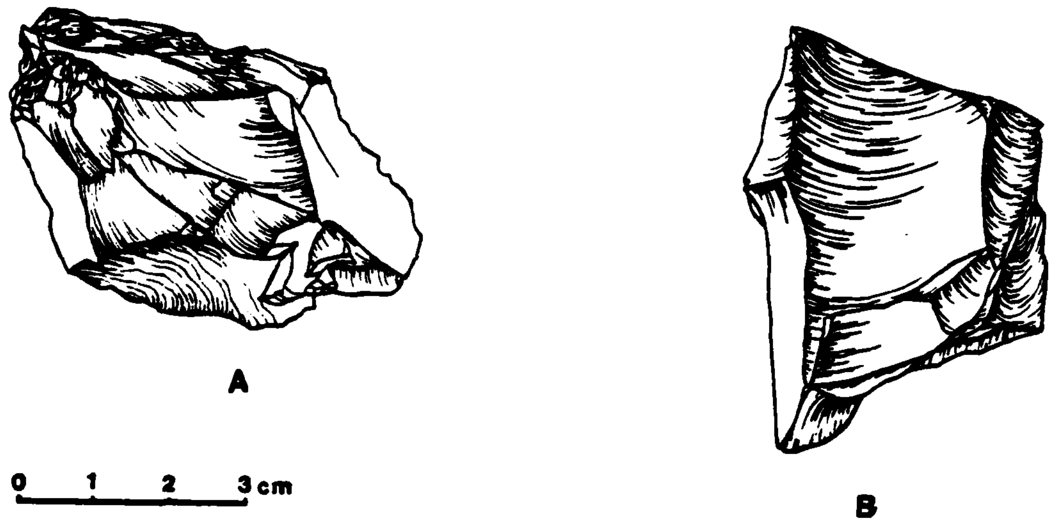


Figure 4.13. Core fragments recovered from the lower levels of 14BU9.

Bifaces, Unifaces, Utilized Flakes, Debitage

These categories are discussed together by levels. Table 7 presents detailed data for bifaces.

Level 5

A total of 133 chipped stone artifacts were recovered in Level 5 (50-60 cm. BS); five of these are tools. Two unifacially retouched tools are present (Fig. 14 A,B). One is an ovate end scraper produced on a thick flake of Flint Hills Green chert. The distal end and portions of both lateral edges have been steeply retouched, and a few flakes were removed from the ventral surface in an apparent effort to thin the flake. Micro-chipping and rounding along the distal edge constitute evidence for utilization. The second uniface is a side scraper made on a long thin flake of heat-treated Florence B chert. This tool has been broken along a line perpendicular to its long axis. Unifacial retouch can be observed all along the lateral edge of the flake blank. The scraper edge is chipped and rounded, showing moderate utilization.

The base of a broken drill made of heat-treated Florence A chert (Fig. 14C) was also recovered. This tool is completely covered with invasive bifacial retouch. It was broken by a lateral snap diagonally across the long axis just above the point at which the base begins to expand. The type and placement of the break suggests that the break occurred during utilization of the tool.

Level 6

Level 6 yielded only two chipped stone tools out of a total of 147 chipped artifacts. Both of these are fragments of invasively retouched bifaces produced on blanks of heat-treated Florence A chert. The first (Fig. 15A) exhibits three breaks, one snap perpendicular to the long axis of the tool, one deep edge collapse scar along the lateral margin which truncates the third deep V-shaped break at the distal end. Chipping and rounding suggest that this tool was heavily worn, and the extensive damage and signs of utilization along one of the broken edges indicate that attempts were probably made to rework and/or reuse this tool. The second tool (Fig. 15B) was destroyed by two lateral snaps perpendicular to the long axis. These left only a mid-section with battered and worn lateral edges.

Level 7

A single unifacially retouched tool was recovered in Level 7 along with 231 other chipped stone artifacts. This tool (Fig. 16) was made by placing unifacial retouch along one lateral edge of a flake of Florence A chert. The flake was not extensively modified as cortex and ripple marks are still visible. The tool has been damaged by a lateral snap diagonal to the flake axis and by much crazing and potlidding. It cannot be determined whether or not the tool was retouched before or after it was thermally damaged.

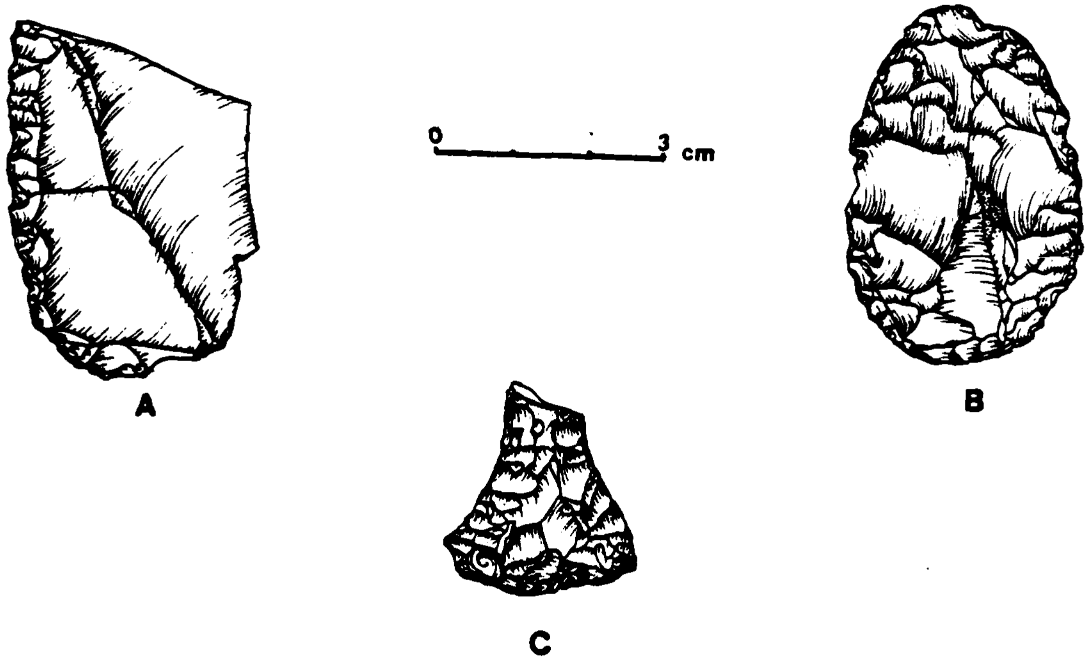


Figure 4.14. Tools from Level 5, 14BU9.

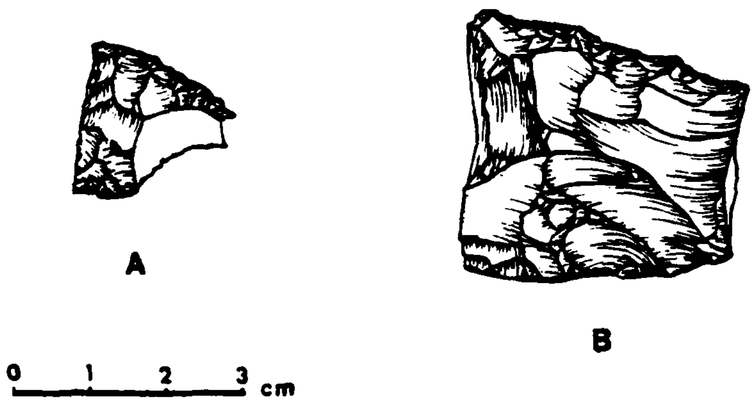


Figure 4.15. Tool fragments recovered from Level 6, 14BU9.

Figure 4.16. Unifacial tool from Level 7, 14BU9.

Table 4.7. Summary of data concerning the bifacial tools recovered from excavations in the Archaic levels at the Snyder site.

CATALOG NUMBER	LEVEL - cm. B.S.	TOOL TYPE	CHERT TYPE	HEAT TREATMENT	CONDITION	WEAR
A5005279-3	50-60	drill	Florence A	Present	broken	Indet.
A5009079-2	60-70	bif /unif.	Florence A	Present	broken	Present
A5010479-2	60-70	knife ?	Florence A	Absent	broken	Present
A5015279-30	80-90	stemmed point	Green	Present	broken	Indet.
A5016379-1	80-90	indet.	Florence A	Present	broken	Present
A5018979-3	90-100	stemmed point	misc.	Absent	complete	Indet.
A5018179-4	90-100	stemmed point	Florence A	Present	broken	Present
A5016579-2	90-100	stemmed point	Green	Absent	complete	Indet.
A5018279-4	90-100	knife ?	Florence A	Present	broken	Present
A5017179-2	90-100	bif./unif.	Florence A	Present	broken	Present
A5018379-2	90-100	indet.	Florence A	Present	broken	Present
A5017579-1	90-100	indet.	Florence B	Absent	broken	Absent
A5016579-11	90-100	indet.	Florence A	Absent	complete	Absent
A5016579-3	90-100	chopper ?	Florence B	Absent	complete	Present
A5018979-6	90-100	indet.	Cresswell	Present	complete	Absent
A5021479-12	100-110	indet.	Florence A	Absent	broken	Indet.
A5019579-11	100-110	indet.	Florence A	Absent	broken	Present
A5019579-2	100-110	point tip	Florence A	Present	broken	Indet.
A5020779-7	100-110	indet.	Florence B	Present	broken	Indet.
A5019079-7	100-110	indet.	Light Gray	Present	broken	Indet.
A5020879-5	100-110	knife?	Florence A	Absent	broken	Present
A5021279-21	100-110	stemmed point	Florence A	Present	broken	Indet.
A5019079-5	100-110	knife ?	Florence B	Indet.	broken	Present
A5020879-1	100-110	drill ?	Florence A	Present	broken	Indet.
A5020279-4	100-110	indet.	Florence A	Absent	broken	Indet.

Table 4.7. Cont'd.

CATALOG NUMBER	LEVEL - cm. B.S.	TOOL TYPE	CHERT TYPE	HEAT TREATMENT	CONDITION	WEAR
A5021279-12	100-110	stemmed point	Florence B	Absent	broken	Indet.
A5021570-1	100-110	celt ?	Rotted Chert	Absent	complete	Absent
A5008779-23	100-110	indet.	indet.	Present	broken	Indet.
A5008579-19	100-110	indet.	Light Gray	Present	broken	Present
A5008479-19	100-110	stemmed point	Florence A	Present	broken	Indet.
A5022779-5	110-120	stemmed point	Light Gray	Present	broken	Absent
A5022679-11	110-120	notched point	Florence B	Present	broken	Present
A5023679-16	110-120	stemmed point	Green	Absent	broken	Indet.
A5022979-8	110-120	point tip	Florence A	Absent	broken	Indet.
A5022079-16	110-120	stemmed point	Florence A	Present	broken	Indet.
A5025179-4	120-130	knife ?	Florence A	Present	broken	Present
A5024779-5	120-130	indet.	Florence A	Absent	broken	Absent
A5024679-3	120-130	indet.	Florence A	Absent	complete	Absent
A5026179-19	120-130	indet.	Florence B	Absent	broken	Present
A5025879-1	120-130	knife ?	Florence A	Absent	broken	Present
A5028479-1	130-140	stemmed point	Foraker	Absent	broken	Indet.
A5028279-8	130-140	indet.	Light Gray	Absent	broken	Absent
A5028779-7	130-140	indet.	Florence A	Present	broken	Absent
A5027579-6	130-140	indet.	Florence A	Present	broken	Present
A5028979-4	130-140	indet.	Cresswell	Absent	broken	Absent
A5028079-1	130-140	indet.	Florence A	Present	broken	Absent
A5026979-2	130-140	indet.	Florence B	Absent	broken	Absent
A5027079-7	130-140	indet.	Cresswell	Absent	complete	Absent

Level 8

A core, a flake blank, two biface fragments, and 327 other pieces of chipped chert were recovered from Level 8 (Fig. 17). Both biface fragments are made on heat-treated materials. One is a projectile point base (Fig. 17B) of Flint Hills Green chert. It is a small flaring stem snapped off just above the point at which it expanded into the main body. The second (Fig. 17A) is an ovate form broken by a crenated heat fracture perpendicular to its long axis. The material on which it was produced was heat-treated Florence A chert. One large flake blank (7.54 cm. by 3.05 cm.) was also recovered (Fig. 17C). It was struck from a core of Florence B chert and not retouched.

Level 9

Chipped stone tools from Level 9 (90-100 cm. BS) include: two unifaces, two large flake blanks, three projectile points, and eight biface fragments. The projectile points (Fig. 18) are each quite distinct from the others. One is a corner-notched, triangular shape with a flaring stem (Fig. 18C). The second is a round-shouldered, stemmed point with a concave base (Fig. 18A). The third (Fig. 18B) is an elongate, narrow form with a side-notched stem and a convex base. The latter point is made of Flint Hills Green chert, and the previous pair of a miscellaneous variety and Florence A, respectively. Only the Florence A was heat treated.

Six of the eight biface fragments (Fig. 19) appear to have met their demise through use or attempts at resharpening or recycling. The working edges are heavily step fractured and rounded, and all but one exhibit one or more lateral snaps. These types of breaks most often occur during use or manufacture of a tool (Collins 1974:181). When the break truncates utilized edges it can be assumed to have resulted from use or the reworking of a worn tool.

The remaining biface fragments show no signs of having been utilized. One is invasively flaked over only a portion of its surface. The ventral surface is still unmodified except for some marginal flaking. There are no signs of wear on the edges. The second is a roughly knapped, thick, ovoid biface with a broken tip. Here, again, the edges are sharp and do not appear to be worn.

Two large, complete flakes were also found in this level. One shows unifacial utilization along the lateral margin of the dorsal surface (Fig. 20A). The second is a very thin square flake of Florence B chert. No signs of use or preparation for further reduction are visible (Fig. 20B).

Both unifacial tools from Level 9 were made on flake blanks. The first (Fig. 21A) is a double side scraper made of Florence A chert. The distal section of the flake was modified with unifacial retouch along both margins. The working edges exhibit step fracturing and rounding attributed to wear. The second uniface (Fig. 21B) is a broken side scraper produced on a blank of Florence B chert. There are two breaks which are perpendicular to the long axis of the tool, truncating the retouch which runs along the lateral margin. The working edge is stepped and somewhat rounded. The

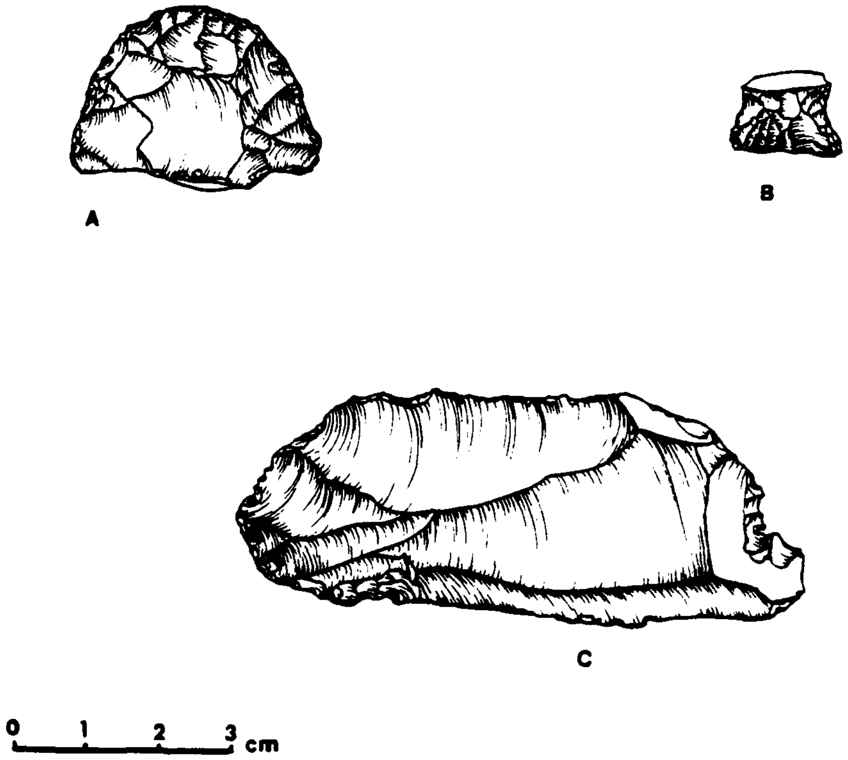


Figure 4.17. Tools excavated from Level 8, 14BU9.

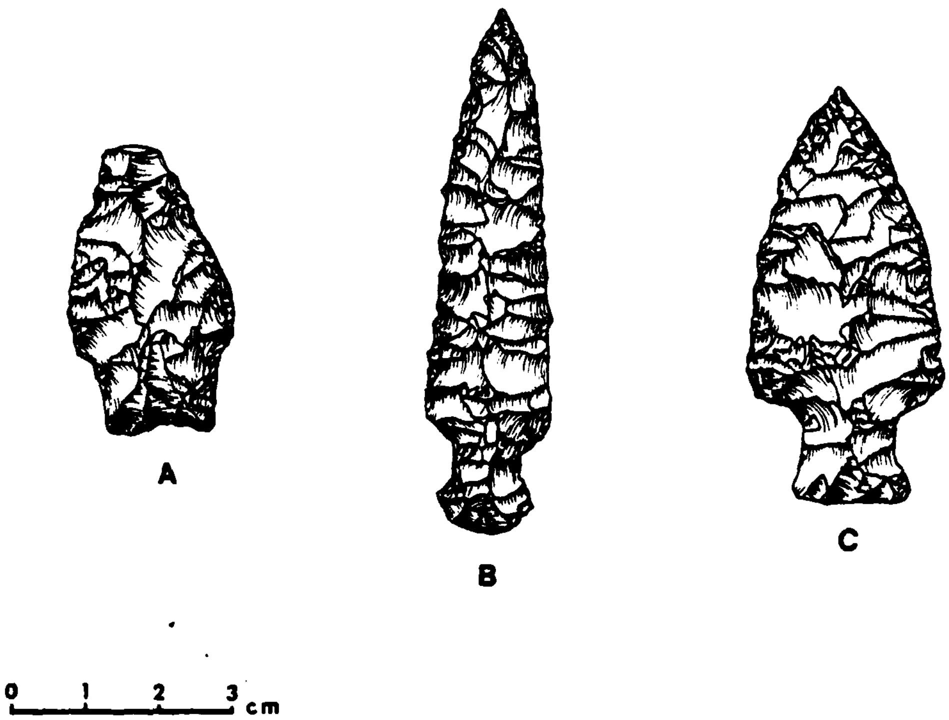


Figure 4.18. Projectile points recovered from Level 9, 14BU9.

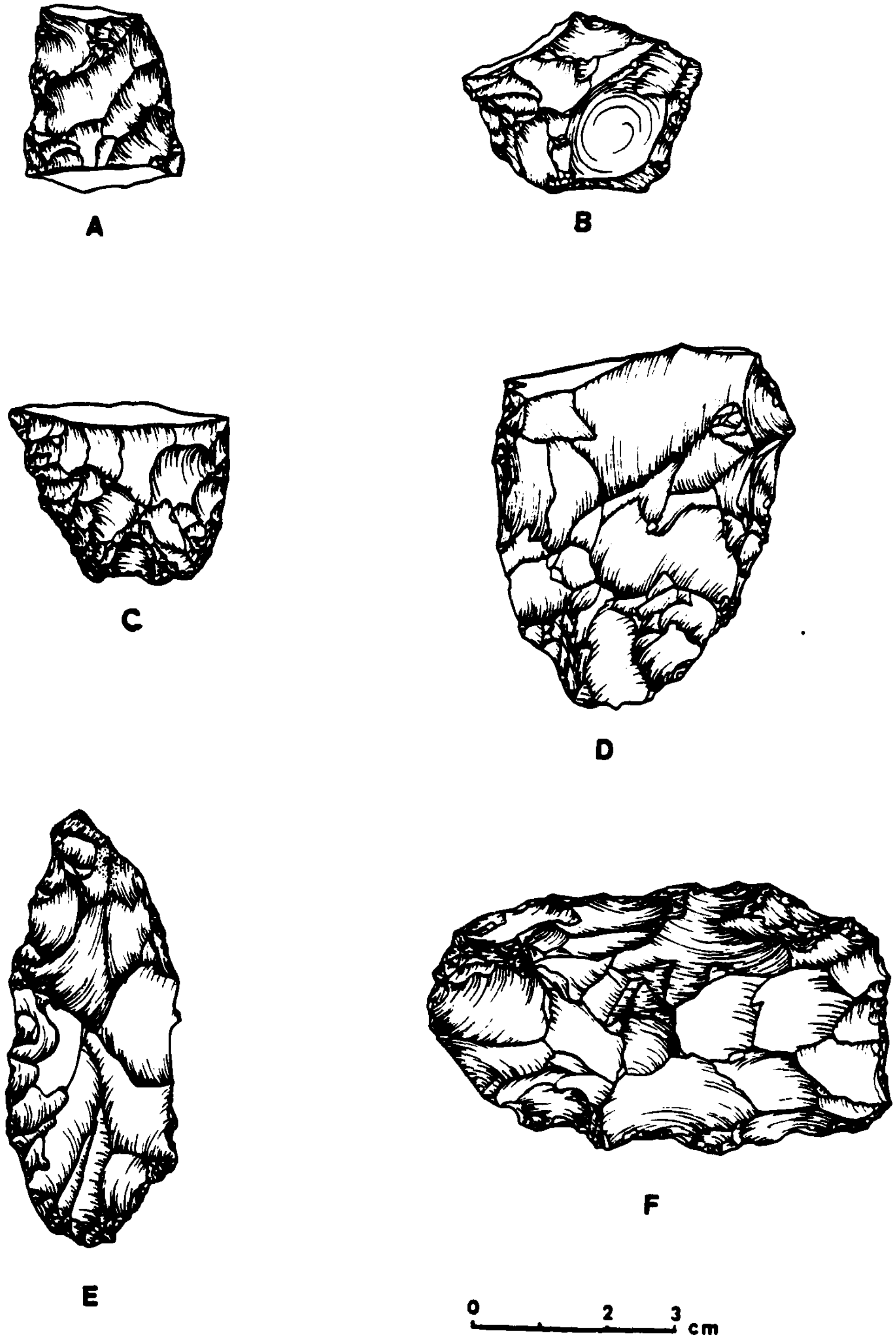


Figure 4.19. Six biface fragments from Level 9 which appear to have been broken through use, or reworking.

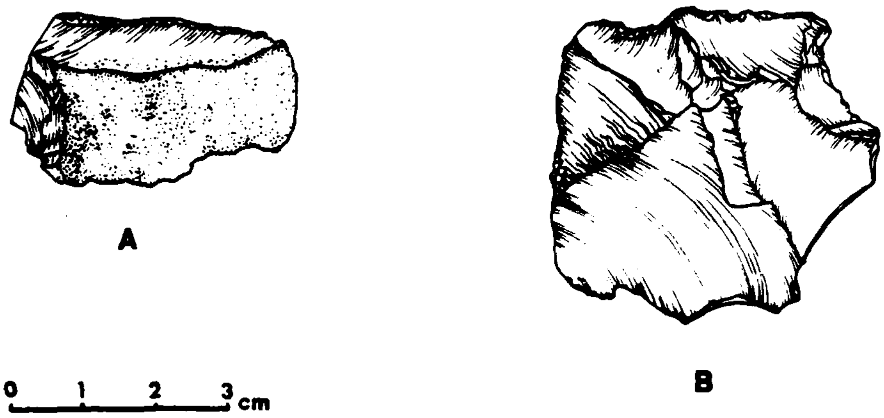


Figure 4.20. Flakes and flake tools from Level 9, 14BU9.

Figure 4.21. Unifacial tools from Level 9, 14BU9.

0 1 2 3 cm

damage could have taken place during use of the tool, especially if it were hafted.

Level 10

Level 10 yielded one core fragment, a celt, four point fragments, a possible drill base, and nine biface fragments. Most of the fragments consist of edge collapse flakes or midsections. Two appear to be the butt ends of ovate bifacial knives or preforms broken by lateral snap. The edges of these show either evidence of wear or grinding for platform preparation. These features and the nature of the breakage suggests the possibility that these tools were broken during use and abortive attempts were made to rework them. The drill base (Fig. 22B) exemplifies this hypothesized system. This biface exhibits much thermal damage in the form of crazing and potlidding and a lateral snap just above the point at which the sides become parallel. The undamaged lateral edges show platform preparation and platform remnants, raising the possibility that this was a broken or worn projectile point or knife which broke irrevocably while being reworked into a drill.

The projectile points are also fragmentary. Figure 22A illustrates the most complete specimen, a triangular, stemmed point 6.6 cm. long which exhibits a large edge collapse scar on one side. It was apparently unfinished; it is not evenly thinned, and the lateral margins show platform preparation. The other point fragments include a tip, a portion of a flared, convex base stem, and a short, wide, thermally damaged stem. Figure 22C illustrates the celt made from heavily weathered chert. The rotted surface on one side would not fracture concoidally and was left unmodified.

Level 11

The fragmentary remains of five bifaces and one uniface were recovered from Level 11. All of the bifaces are apparently remains of damaged projectile points. Four are the lower portions of large, stemmed points: one wide triangular, side notched form with a very wide stem, and two narrow, parallel-sided stem fragments. The fifth point fragment is the distal end of a narrow, nearly straight-sided point. All were broken by one or more lateral snaps and/or by thermal clastic damage. The unifacial tool was made on a roughly triangular flake of Flint Hills light gray chert, the retouch placed along one lateral margin. The tool was subsequently destroyed by potlidding and crazing.

Level 12

In Level 12, five bifaces, one uniface, a flake blank, and a core were recovered (Fig. 23). The uniface is a fragment made on a flake of Florence A chert. The distal end is heavily stepped and a hinge fracture covers one side. The majority of the bifaces are represented by medial or distal fragments. They appear to represent a variety of sizes of generally oval or triangular shapes.

One unifacially utilized flake fragment and eight bifaces constitute

the chipped stone tool assemblage from Level 13 (130-140 cm. BS). Most significant among the assortment of biface fragments is the lower portion of a stemmed point made of Foraker chert. This nonlocal chert occurs only rarely as artifacts in the drainage of the east branch Walnut River. When it is found it is always in the form of a blank or, most often, as a completed tool. The nearest source of this chert is the drainage of Otter Creek in southeast Cowley Co., Kansas. The remaining bifaces are either broken or unfinished tools made of local materials, including river gravel.

Conclusions and Discussion

The 1979 Phase III field season at Snyder confirmed the primary stratigraphic sequence of soil bodies reported by previous work (cf. Grosser 1970, 1977). We now know, however, that the natural stratigraphy is composed of an internally zoned surface soil, the Vanoss silt loam, which had developed in sediments deposited on a buried soil, the El Dorado paleosol. Even though the excavation did not completely penetrate the paleosol, there is evidence from preliminary analysis that the buried soil is also internally zoned. The significance of these pedogenic related observations is discussed by Artz (this volume). Since the excavation reached only a maximum depth of 140 cm. below ground surface, the precise depth of the paleosol's lower boundary and the nature of sediment units beneath it have not been either confirmed or investigated in any hand-dug excavation.

While an understanding of the Snyder site's natural stratigraphy made partial advances during the 1979 field work, our understanding of the site's cultural stratigraphy and its relationships to the natural stratigraphy became confused; Phase III findings did not correlate well with previous conclusions (Grosser 1970, 1977). Specifically, Phase III work demonstrates that vertical Late Archaic artifact distribution is continuous and coincident with the partially known vertical distribution of the paleosol (Fig. 24). This result contradicts previous work which reported the presence of two discrete vertical zones of Late Archaic occupation. These very different sets of conclusions appear to be the confusing outcome of several different significant factors: (1) the horizontal structure of occupation debris deposited on prehistoric living surfaces, (2) the horizontal structure (especially slope and relief) of prehistoric land surfaces, (3) the vertical blending and masking of prehistoric occupation zones by pedogenic and pedoturbation processes, (4) the probable presence of an erosion surface at the top of the paleosol, and (5) the fine grained control and recovery techniques applied to the Phase III block excavation.

Within the goal framework of the El Dorado Lake research design (Leaf 1979), the field strategy at Snyder (Phase II, III) has been and should continue to be the controlled retrieval of comparable specimen samples. These procedures include obtaining larger samples from components previously investigated by techniques either unknown to or unused by earlier excavators (such as dry sifting, flotation, water screening, three dimensional plotting, sediment and pollen analysis, etc.). Additional field work should specifically investigate deeply buried artifact bearing stratigraphic units that were not reached in previous excavations. Field recovery and recording

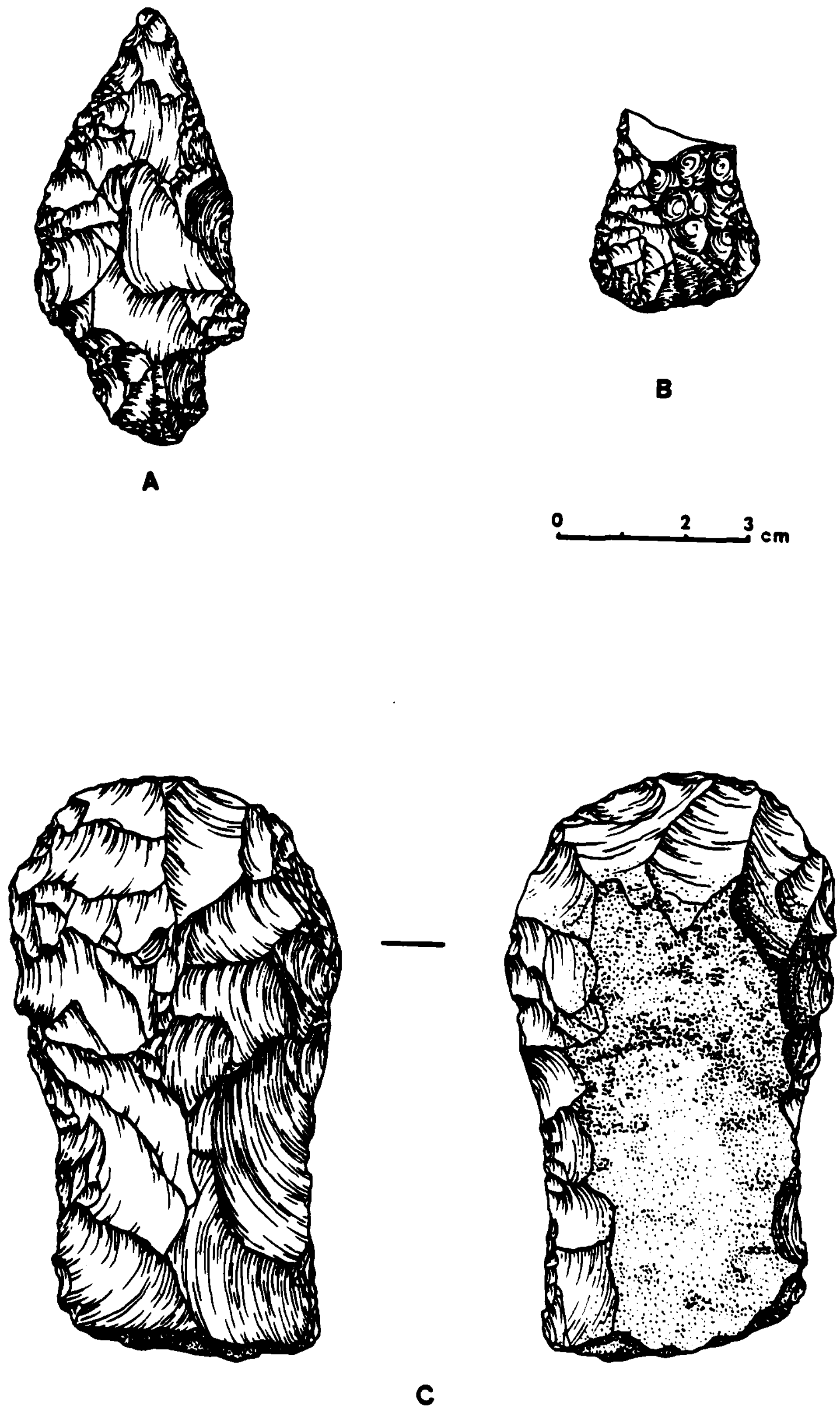


Figure 4.22. Tools excavated from Level 10, 14BU9.

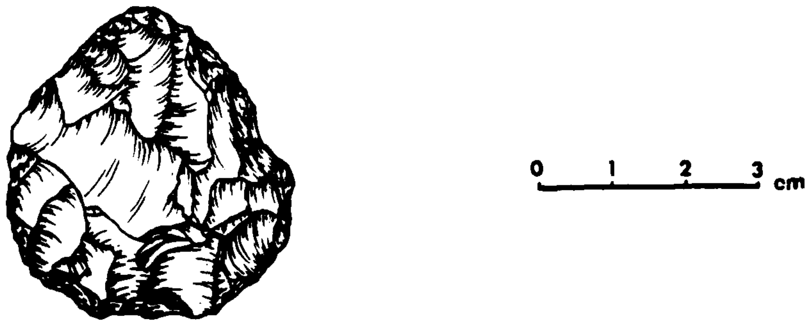
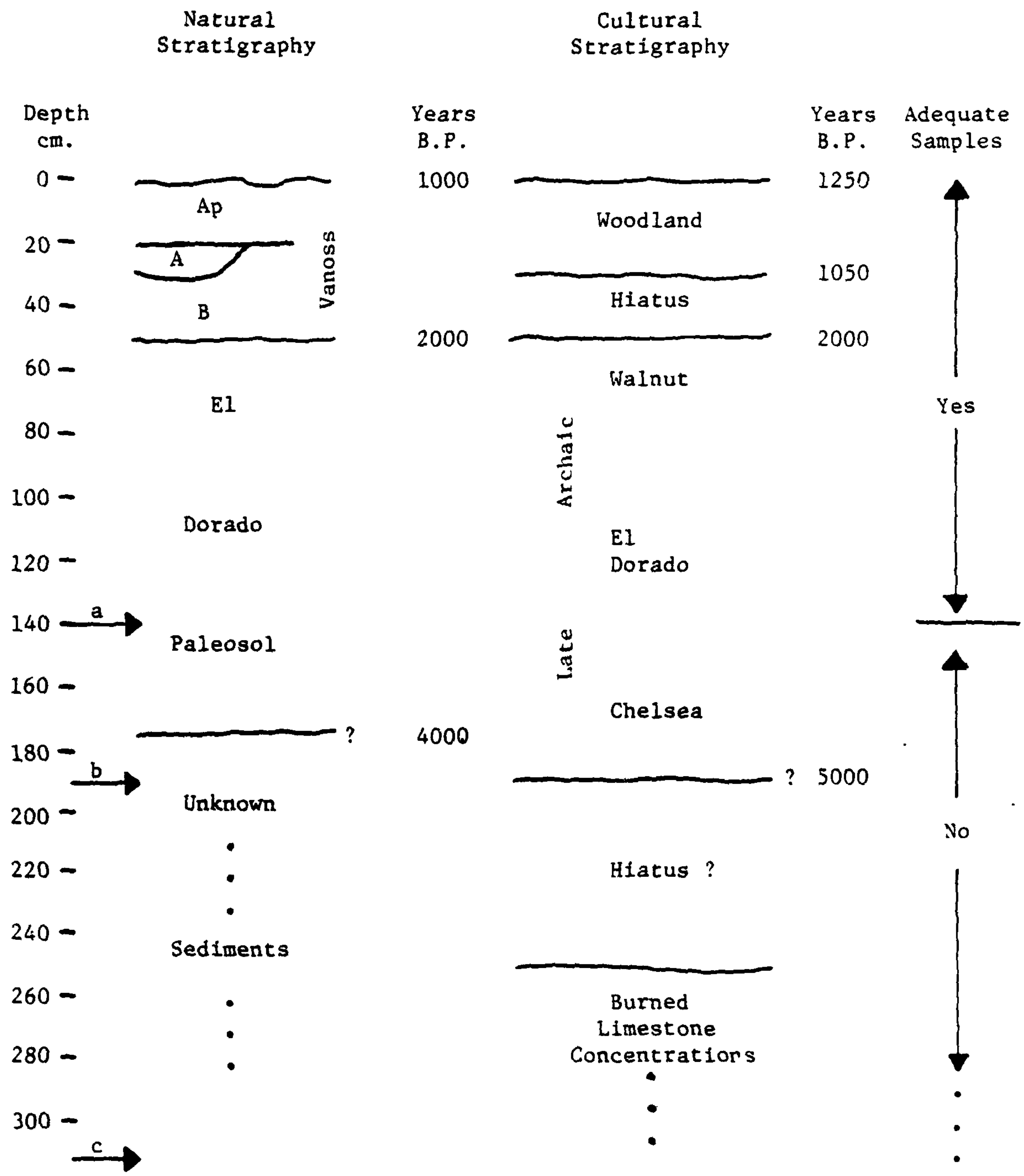


Figure 4.23. Tool from Level 12, 14BU9.



Maximum penetration of (a) controlled excavation, (b) test pit, and (c) backhoe.

Figure 4.24. Diagrammatic relationships between probable natural and cultural stratigraphy.

techniques were standardized on Snyder during Phase II and III as far as possible in order to insure that biases attributable to differences in those areas can be ruled out when comparative statements are formulated about differences versus similarities among various components.

During the field season of 1970 a backhoe trench was cut from east to west across the El Dorado terrace on which 14BU9 is located to obtain a profile of natural stratigraphy. The backhoe encountered "burned limestone concentrations associated with only one tool" (Grosser 1977:37) at a depth of 250 cm. below ground surface. It is important to note that the deepest hand-dug excavations on Snyder are a small number of two meter test pits which penetrated to 190 cm. (Fig. 24). All deeper penetrations have been made or aided with either a backhoe or a front-loader (Grosser 1970, 1973, 1978; Leaf n.d.). In general, Late Archaic, and probably earlier, occupations in the El Dorado Lake area are not visible in a machine dug trench as either a distinct anthrosol or an easily detectable concentration of artifacts. The known Archaic occupation zones in the area have extremely low artifact density and are very difficult to locate in machine dug excavations (cf. Artz, this volume) unless limestone concentrations are encountered.

Thus, continued controlled excavation on this demonstrably significant site is warranted for several reasons. First, there are no extant artifact or sediment samples that could, by any standards, be considered adequate from 140 cm. down to wherever the bottom of the site (occupation zones) turns out to be. Second, no hand-dug or machine aided excavation has ever found the bottom of the site. Third, the occupational or artifactual hiatus between 200-250 cm. depth is inferred only from absence of artifacts retrieved by machinery (Fig. 24); this may only mean lack of burned limestone or other highly visible artifact concentrations. Fourth, extensive backhoe trenching will reveal the lateral distribution of sedimentary units and may reveal the same for cultural occupation zones if they can be detected. However, backhoe trenches can not substitute for the controlled (i.e., hand-dug) excavations which are absolutely required for the accurate and precise determination of relationships among cultural and natural stratigraphic units below 140 cm. (among all the other specific and general archeological problems that should be addressed at Snyder).

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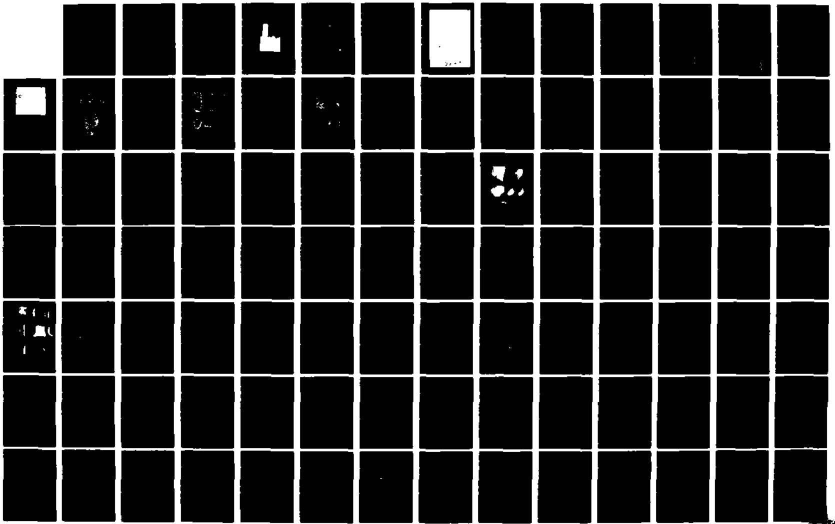

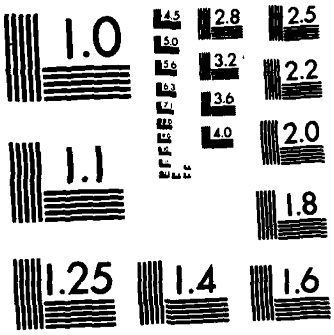

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CHAPTER 5

SITE 14BU57

Marie E. Brown.

Introduction

Site 14BU57 is situated on the first terrace of the Walnut River. It is located approximately 2.0 km. northeast of the dam's axis, near the confluence of Satchel Creek with the Walnut River (Fig. 5.1). The site is bounded on the west by the Walnut River and on the east and north by Satchel Creek.

The site lies in a barnyard of the former Manfred Moore farm and covers an area of 2600 Sq. m. or 0.26 hectare. When the site was tested in 1977 the area was surrounded by a barbed wire fence and also contained the remains of a barn and silo. The fence has since been destroyed by logging activities, but the barn and silo are still extant (Fig. 5.2). The 1977 test excavations revealed that the site had formerly been under cultivation (Leaf 1979:115).

Previous Work

Site 14BU57 was found and tested in 1974 by Dr. Patricia O'Brien of Kansas State University. In 1975, the site was surface collected by Darrell Fulmer of the Museum of Anthropology, University of Kansas. No detailed reports have been made for these earlier investigations. As of 1976, no cultural affiliation had been determined for the site, due to a lack of diagnostic artifacts (Fulmer 1977).

The site was tested again in 1977 by Gary Leaf (1979) of the Museum of Anthropology, University of Kansas. Two 2 x 2 m. test pits were excavated (Fig. 5.3). One, XU101, was located at the south end of the site and was excavated to a depth of 50 cm. below surface. The second, XU102, was located at the north end of the site and was excavated to a depth of 60 cm. In addition, a series of controlled posthole tests were also conducted in an effort to delimit the site. Burned earth, daub, pottery, sandstone, limestone, quartzite, bone, charcoal, and chert artifacts were recovered from the test excavations. No features were located and no evidence of deeply buried components was found.

Purpose of Present Investigations

The six pieces of pottery recovered from the 1977 test excavations indicated the presence of a single Woodland component on site 14BU57, but five surface collected projectile points indicated the presence of a possible Plains Village component. All other artifact classes and distributions indicated the presence of only one component, Late Woodland (Leaf 1979). Two hypotheses were advanced for the cultural status of site 14BU57: "(1) there may actually be two distinct components on the site (one Late

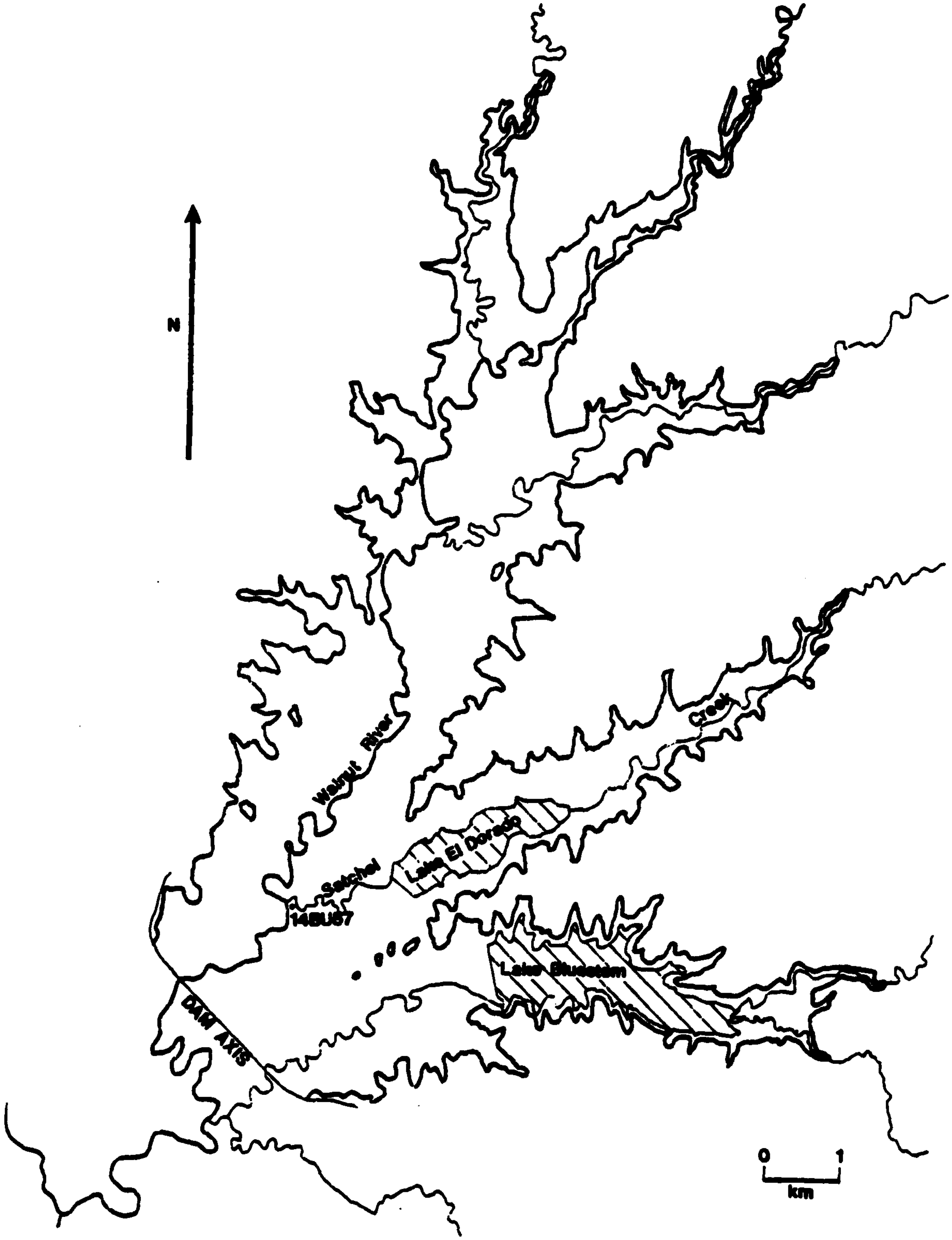

Figure 5.1. Location of site 14BU57 in the El Dorado Lake area.

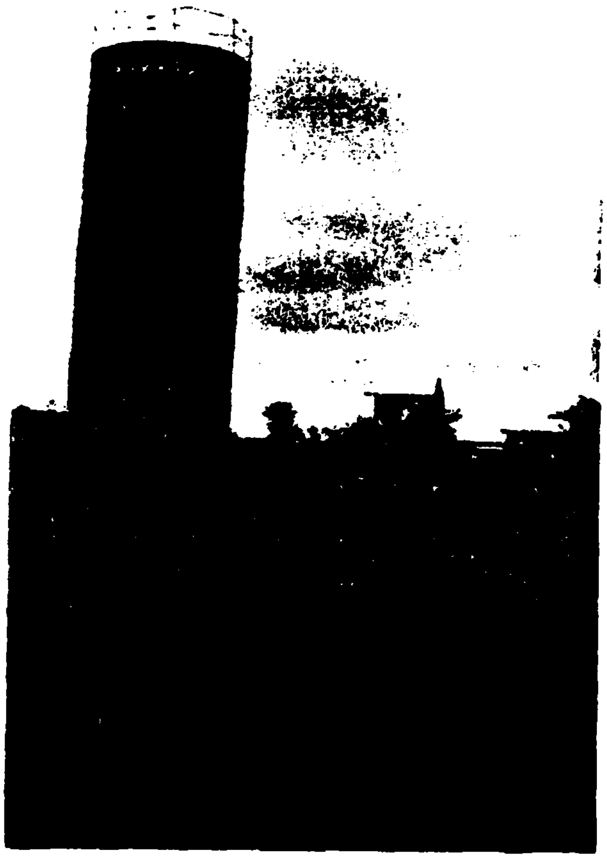

Figure 5.2. View of site 14BU57 looking south.

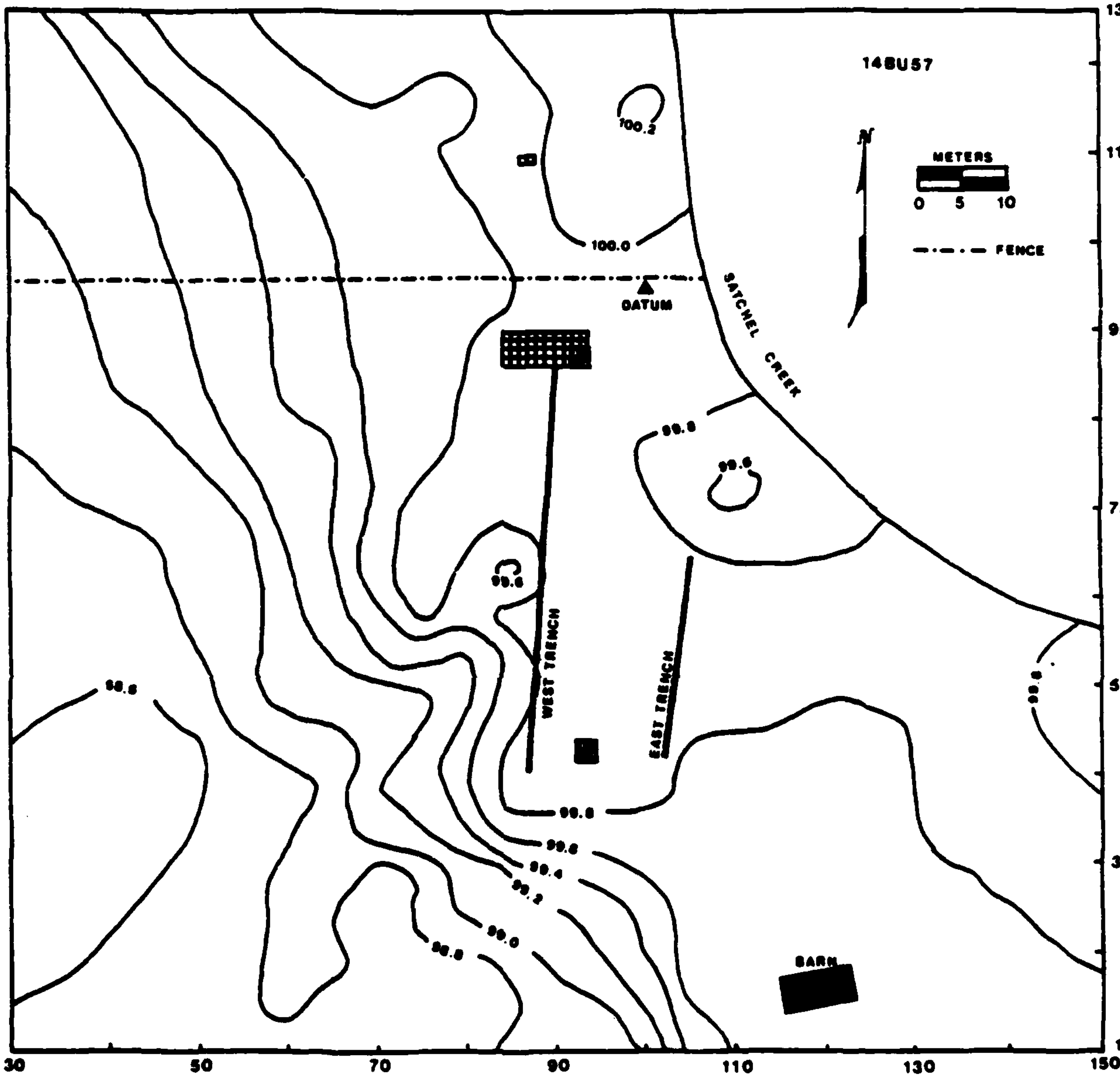

Figure 5.3. Contour map of site 14BU57 showing the location of block excavation, test pit, backhoe trenches, and 1977 test pits.

Woodland and one Plains Village) that are mixed together in the plowzone; the scale of the 1977 investigations (opportunistic surface collection and two small test pits) was not adequate to document the presence of the Plains Village occupation, or (2) there is only one component on 14BU57 that represents part of the transformation of Late Woodland into Plains Village" (Leaf 1979:138). One purpose of the present investigation was to expand the excavations in an effort to determine whether or not two distinct components, Late Woodland and Plains Village, were present on the site.

The present excavations were also undertaken with the hope of uncovering the remains of a house since daub, indicative of the presence of a former structure, was recovered from the 1977 test excavations. Such a structure might provide valuable information concerning settlement patterns, seasonality, subsistence, butchering patterns, and lithic technology. If site 14BU57 was determined to be transitional between Late Woodland and Plains Village, such information would be of great importance in tracing a regional development of Late Woodland into Plains Village.

Excavation Techniques

Since the south end of site 14BU57 was overgrown with 7 ft. tall stinging nettles, making entrance onto the site very difficult, it was necessary to use mechanized equipment to clear a road leading onto the site. Once the site became accessible, the mechanized equipment was used to remove the majority of the tall surface vegetation from the site. After this was done, two parallel backhoe trenches were dug.

Backhoe Trenches

Two parallel backhoe trenches oriented approximately north-south were dug in an attempt to expose features around which block excavations could be opened and expanded. The trenches were 15 m. apart and each was approximately 80 cm. wide and 65 cm. deep. The western trench was 47 m. long and the eastern trench was 23 m. long (Figs. 5.3 and 5.4). No features were encountered in either trench, but the western trench did contain a large quantity of unburned (1124.0g.) and burned (1206.3g.) limestone. Chert debitage was recovered from both ends of the western trench and, in addition, several bifacial tools were recovered from the north end of the trench. On the basis of materials recovered from the two trenches, it was decided to open up a block excavation at the north end of the western backhoe trench (Fig. 5.3). The proposed block excavation area was also in the vicinity of the 1977 XU102 test pit.

Block Excavation

The initial plan was to tie into the 1977 grid system. A search for at least one of four, red wooden stakes that had been placed in fence rows at the extremities of the 1977 north-south and east-west baselines was not successful. Unfortunately, logging activites subsequent to the 1977 excavations had destroyed the fences along with three baseline stakes (the western stake was eventally found late in the season) and the

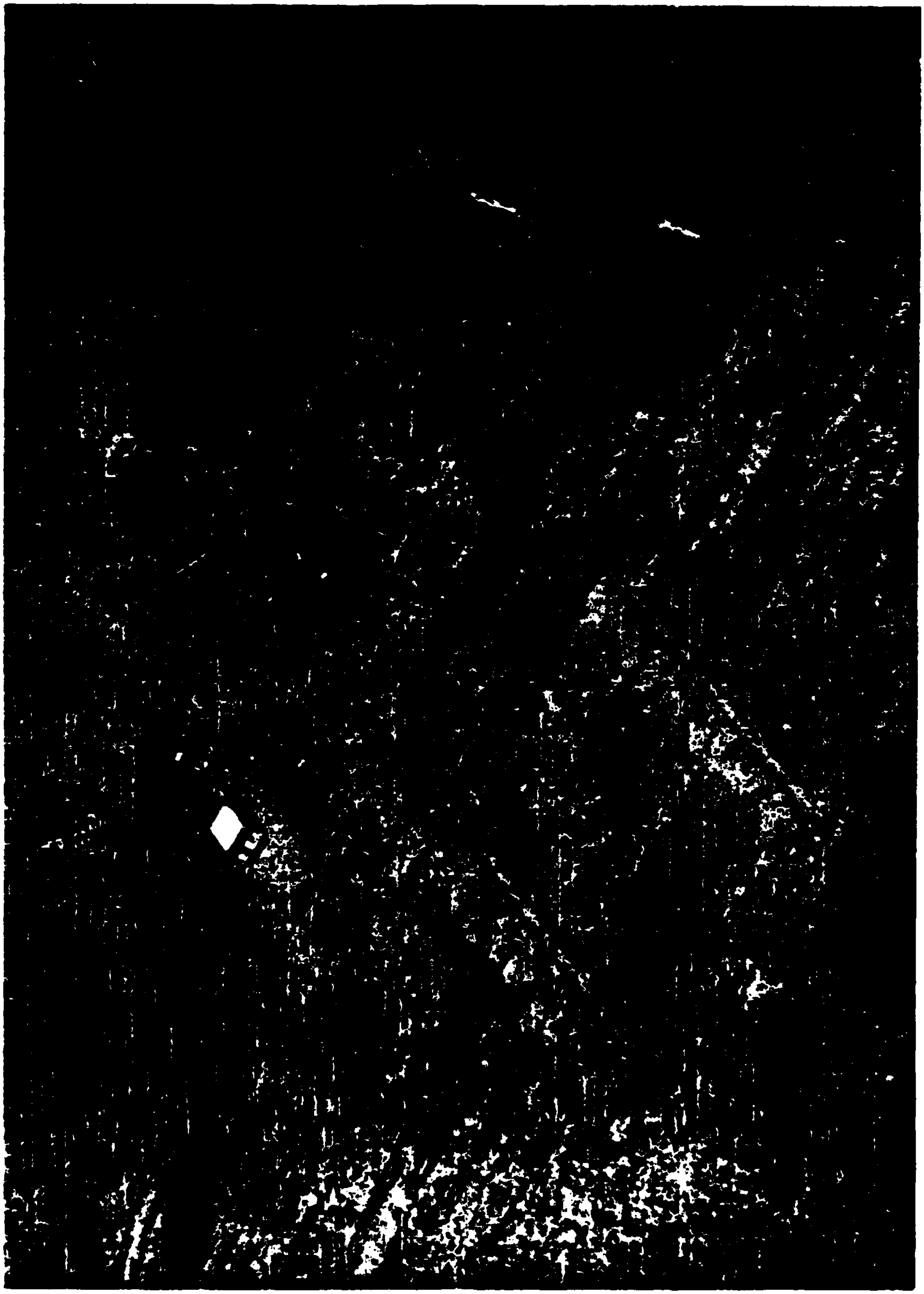

Figure 5.4. Aerial view of site 14BU57, looking toward the northwest.

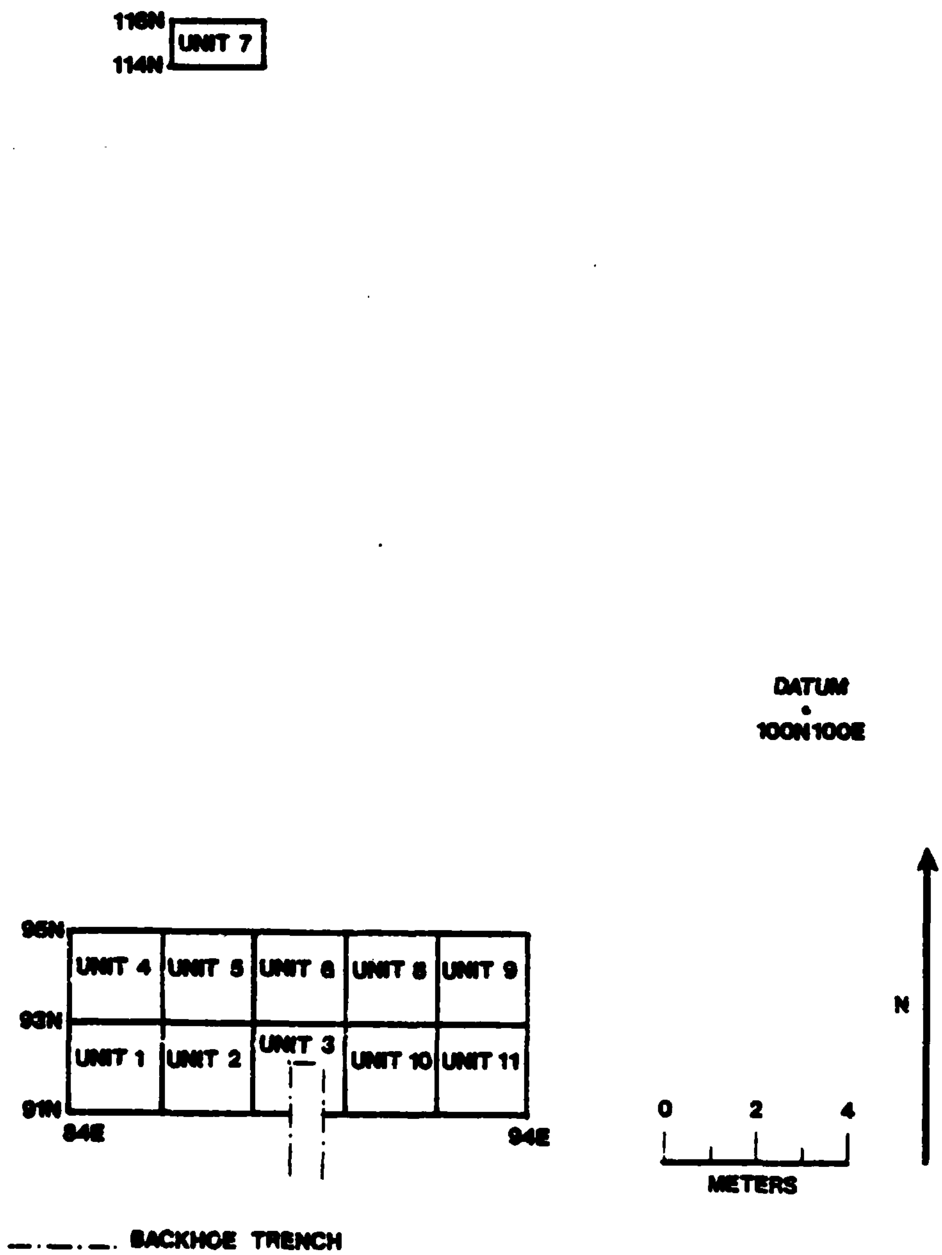

Figure 5.5. Grid system and location of excavation units.

reference point 100N100W. Rather than spending more time of an already short field season to pursue the matter further, a new grid system was established with the hope of eventually finding XU102.

A green, metal fence post was established as the datum in the northeast corner of the site, as the site's limits were defined on the 1977 site map. It is located directly south of the remains of the north fence near the west bank of Satchel Creek. The datum was designated as 100N 100E (Fig. 5.3). Using the datum as the control point, an initial 4 x 6 m. block excavation was staked out. The block excavation was divided into 2 x 2 m. contiguous excavation units numbered 1-6; unit 3 contained the north end of the western backhoe trench (Fig. 5.5). The block excavation was later expanded to include units 8-11. After the plowzone was removed, unit 11 was discerned as being XU102 from the 1977 test excavations. Unit 7 was a 1 x 2 m. test pit located 19 m. north of the block excavation (Fig. 5.5).

Each excavation unit was 2 x 2 m. square. In order to maintain better provenience control for non-three-dimensionally plotted cultural material, each 2 x 2 m. unit was divided into four 1 x 1 m. quadrants. Each quadrant was excavated separately for each level. Excavation was conducted with hand tools (trowels and shovels), and the dirt was sifted through ¼ inch hardware cloth. Beginning with level 2 (99.70-99.60 m.), a 7 l. soil sample for flotation was saved from each quadrant. Exact provenience information was recorded for all tools, potsherds, bone greater than 2 cm. in maximum length, charcoal concentrations, and limestone concentrations found in situ.

Elevations were not recorded as depths below surface. All elevations are relative to the datum. The datum was given an arbitrary elevation of 100 m. as a matter of convenience. In using this method, the height of the instrument (in this case the alidade) was calculated each day by taking a stadia reading at the base of the datum and adding it to the 100 m. elevation of the datum. Excavation readings made with the alidade and stadia rod were subtracted from the height of the instrument (HI) in calculating elevations. Starting elevations were recorded for the corners of each excavation unit. These elevations ranged from 99.72 m. to 99.95 m. In order to keep the levels of each unit even with those of the other units, the ending elevation of level 1 for all units was 99.70 m. As a result, the first level ranged from 16 cm. to 25 cm. in thickness, but all subsequent levels were a constant 10 cm. in thickness. All units, were excavated to a depth of 99.50 m. (level 3). Four quadrants from units 1 and 2 were excavated to 99.40 m. (level 4) and one quadrant from unit 1 was excavated to 99.30 m. (level 5). The elevations of all levels were as follows: level 1, surface to 99.70 m.; level 2, 99.70-99.60 m.; level 3, 99.60-99.50 m.; level 4, 99.50-99.40 m.; and level 5, 99.40-99.30 m.

A unique 8-digit base number was assigned to each quadrant for every level. These numbers contain general provenience information: site number, unit, level, and quadrant. For example, in the number A5705023, "A57" stands for site 14BU57, "05" represents unit 5, "02" indicates that it is the second level, and "3" means that it is the southwest

quadrant. The quadrants are numbered from 1-4, clockwise, beginning with the northeast quadrant: 1 - northeast, 2 - southeast, 3 - southwest, 4 - northwest. The number A5700005 was assigned to surface material and A5700007 was assigned to material recovered from the backhoe trenches. Four additional digits may be attached to the right side of the base number (e.g. A57050230001). These digits are sequential, beginning with 0001, for each base number and they were assigned to individual lithic tools, potsherds, identifiable bones, and flotation samples. Material such as debitage, limestone, burned earth, coarcoal, and unidentifiable bone were only assigned an 8-digit base number.

Test Pit (Unit 7)

In 1977 it had been impossible to test north of the northern fence due to the presence of trees and heavy underbrush, but subsequent logging activities produced open areas. Consequently, a 1 x 2 m. test pit, unit 7, was excavated in such an area, 19 meters north of the main block excavation (Fig. 5.5), with the purpose of establishing whether or not the occupation level extended into that area. The soil was screened, but no flotation samples were collected.

The test pit was excavated to a depth of 99.50 m. (level 3). Level 4 (99.50-99.40) was only excavated in the eastern half of the unit. Cultural material, consisting mainly of debitage, was encountered in all levels, but it was sparse. No diagnostic artifacts or features were recovered. The northward extension of the site was confirmed.

Block Excavation: The Data

Since the site had not been under cultivation for a number of years and surface visibility was poor, no surface collecting, per se, was undertaken, although a few artifacts were recovered from the surface in the vicinity of the block excavation. Only evidence for a single component occupation was uncovered; therefore, the surface material and the lithic tools recovered from the western backhoe trench will be described together with the material recovered from the block excavation.

As noted earlier, unit 11 was discovered to be 1977's test pit XU102. Unit 11 almost encompasses it exactly (Fig. 5.3). No material will be described for this unit since it contained highly disturbed backfill material.

Stratigraphy

When the west and north walls of the block were profiled, two strata were observed (Figs. 5.6 and 5.7). The transition was difficult to see in the field. The upper stratum is a 16-20 cm. thick plowzone. Both strata are loamy, but the second stratum is slightly darker than the plowzone. It seems apparent that the cultural material recovered from these two strata are part of the same occupation zone, the second stratum being the undisturbed portion of the occupation zone.

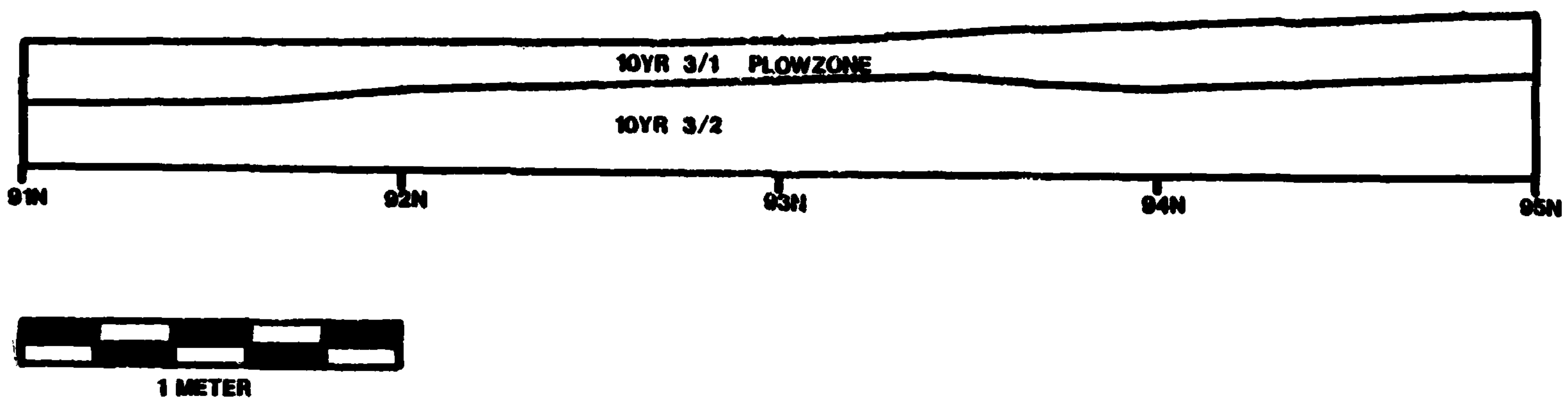

Figure 5.6. Profile of west wall (84E) of block excavation (14BU57).

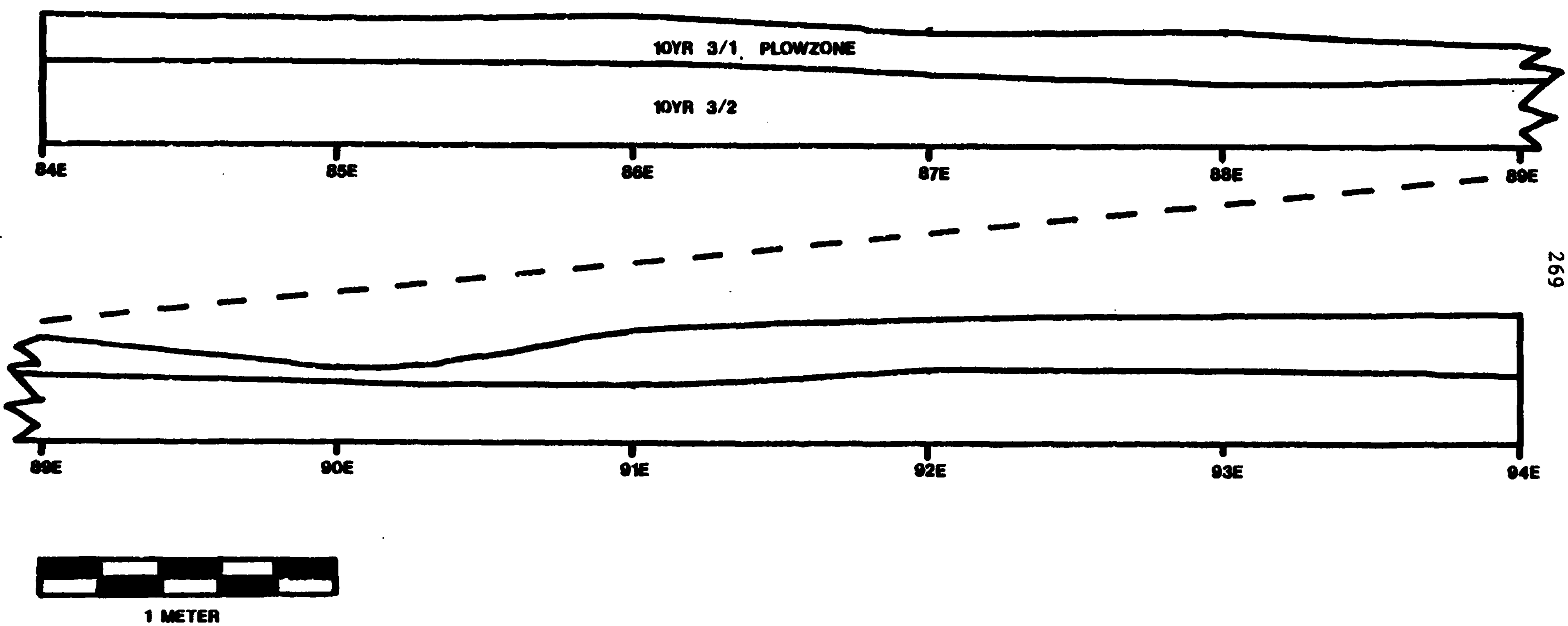

Figure 5.7. Profile of north wall (95N) of block excavation (14BU57).

Feature

A single feature, a pit, first observed as a dark, charcoal flecked stain, was encountered in level 3 (99.60–99.50 m.) of the northeast and southeast quadrants of unit 10 (Figs. 5.8 and 5.9). It probably extended up into level 2 (99.70–99.60 m.) before it was discerned in level 3. The pit was somewhat oval in shape, being 45 cm. long, 30 cm. wide, and at least 15 cm. deep (Figs. 5.8 and 5.9). It had sloping sides and a somewhat flattened bottom. The east side of the pit was truncated by rodent activity. The entire fill was saved for water flotation. Debitage (2.0g.), charcoal (6.2g.), burned earth (4.6g.), limestone (1.0g.), charred Black Walnut meat (N=1), and bone (0.5g.) were recovered from flotation. No tools, pottery, or large faunal remains were present in the pit.

Historic Assemblage

Historic material was only encountered in the plowzone. The material recovered from the block excavation includes one ironstone ceramic fragment, 4 round nails, 4 square nails, 15 pieces of wire, 3 unidentifiable pieces of metal, one 22 cal. long rifle bullet, 3 bottle glass fragments, and 2 flat glass fragments. A harrow spike was also recovered from the western backhoe trench.

Lithic Assemblage

For a description and discussion of the various cherts referred to in this section, see Haury, Phase II El Dorado Report (1981). Length measurements were calculated along the axis of percussion. If the axis of percussion could not be determined, length was measured as the largest maximum dimension.

Projectile Points (N=3)

One specimen, A57100220003, is complete (Fig. 5.10a). It is a small, triangular, corner-notched point of Florence B chert. The lateral edges are slightly convex and the base is straight. It is 15.9 mm. long, 10.6 mm. wide, and 2.8 mm. thick.

The second specimen, A57060140002, is nearly complete (Fig. 5.10b). It is a medium-size, corner-notched point made of Flint Hills Light Gray chert. The lateral edges are straight to slightly convex. A portion of the convex base is missing. An impact fracture is present on one surface of the distal end. The specimen is 51.0 mm. long, 24.0 mm. wide, and 7.8 mm. thick.

The third specimen, A57000050002, is the base of a projectile point (Fig. 5.10c). It was recovered from the surface of the site just to the south of unit 1. This specimen is made of thermally altered Florence A chert. It is the straight base of a corner-notched point. It measures 4.9 mm. thick.

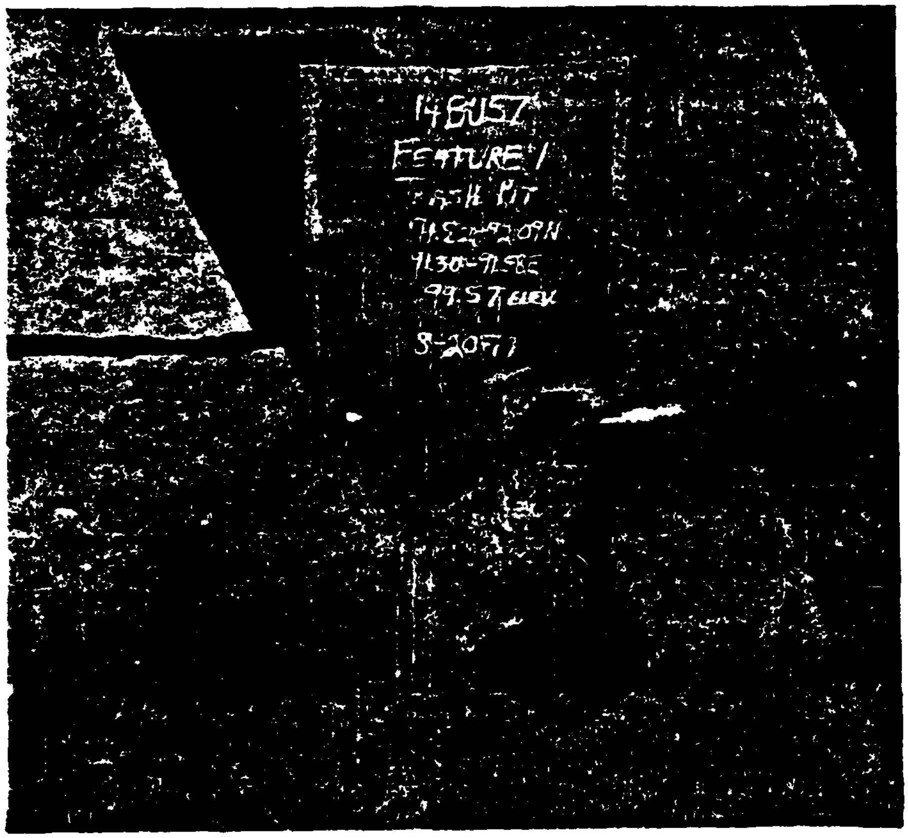

Figure 5.8. Feature 1 after removal of fill.

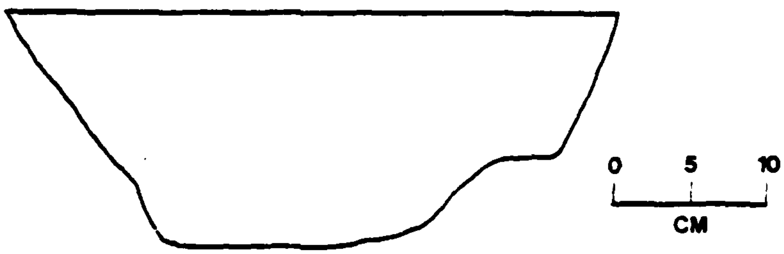

Figure 5.9. Profile of Feature 1 (14BU57).

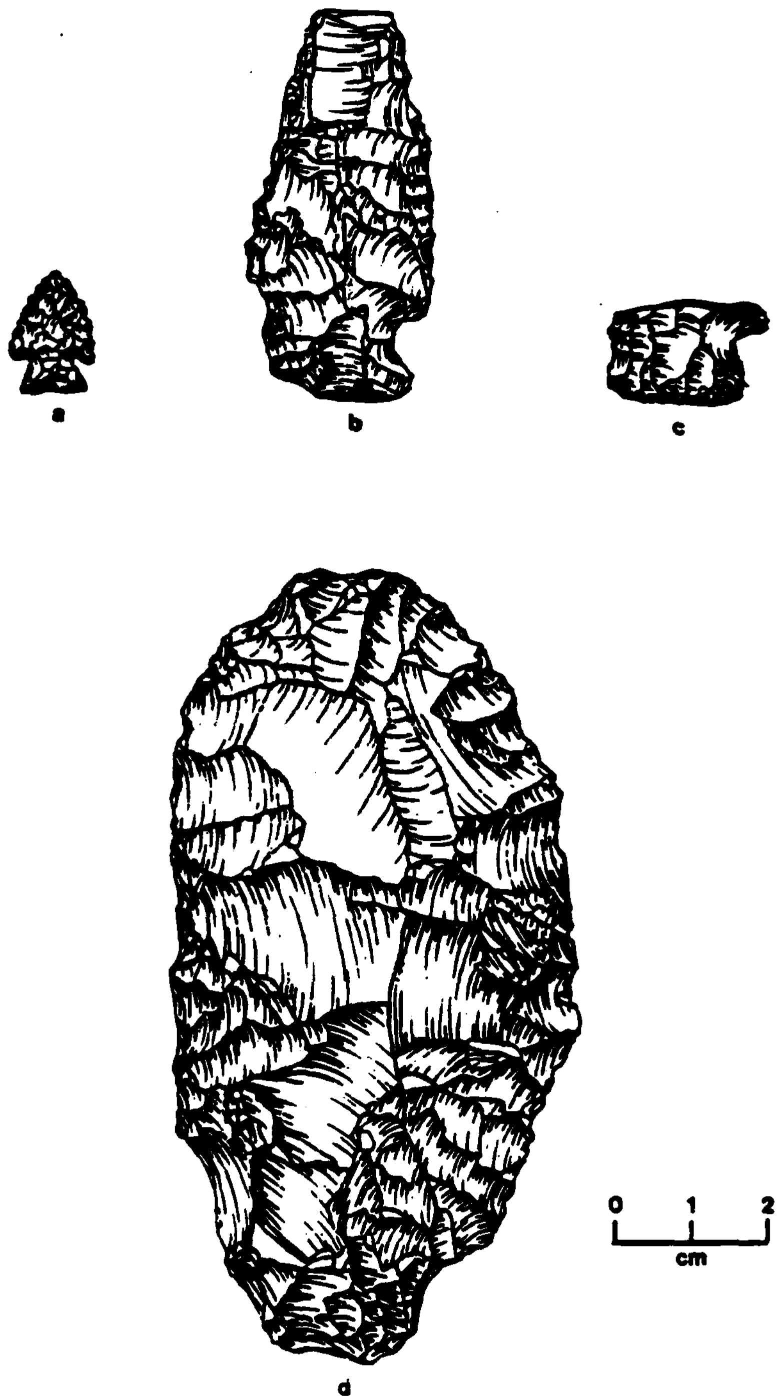

Figure 5.10. Lithic artifacts from 14BU57: (a-c) projectile points (a, A57100220003; b, A57060140002; c, A57000050002), (d) celt (A57000070001).

Celt (N=1)

A single, complete specimen, A57000070001, was recovered from the north end of the western backhoe trench (Fig. 5.10d). It is made of Flint Hills Light Gray chert. The lateral edges are convex and expand toward the working edge which is rounded. It is ovate in outline and lenticular in cross-section. It measures 102.2 mm. long, 51.6 mm. wide, and 25.5 mm. thick.

Chopper (N=1)

One broken specimen, A57100230001, was recovered. It is made of Flint Hills Light Gray chert. The break is a lateral snap. It has been bifacially modified and is biconvex in cross-section. The rough appearance of the specimen indicates that it was never finished before it broke. It is 25.6 mm. thick.

Bifaces (N=17)

Only one specimen, A57020210001, is complete (Fig. 5.11a). It is made of Florence B chert that has been invasively modified on both surfaces. The lateral edges are parallel and the ends are convex. It is biconvex in cross-section. Descriptive data are listed in Table 5.1.

Three specimens are tip fragments. The first, A57050140001 (Fig. 5.11b), is made of Cresswell chert which has been thermally altered at the extreme distal end. It is biconvex in cross-section. Both surfaces have been invasively modified and the lateral edges are convex. The second tip, A57050320002 (Fig. 5.11c), is made of Florence B chert. It is biconvex in cross-section and the lateral edges are convex. Invasive modification is present on both surfaces. The third specimen, A57010320001, is made of Flint Hills Light Gray chert. It is plano-convex in cross-section. Only one surface has been invasively modified. The other surface has only been marginally modified. The lateral edges are straight to slightly convex. All three tips exhibit lateral snaps. Descriptive data are listed in Table 5.1.

One biface fragment is a base. Specimen A57020120001 (Fig. 5.11d) is made of Florence B chert. The base is concave and the lateral edges are convex and converge toward the missing tip. It is biconvex in cross-section. Invasive modification is present on both surfaces. Table 5.1 lists descriptive data.

The remaining twelve fragments are mid and edge sections. One mid section, A57090110001, had a lateral edge modified into a scraper apparently after it had been broken (Fig. 5.11e). One edge section, A57100120006, is a bifacial resharpening flake. Descriptive data for all bifaces are listed in Table 5.1.

End Scrapers (N=4)

One complete end scraper, A57000050001 (Fig. 5.11f), was recovered

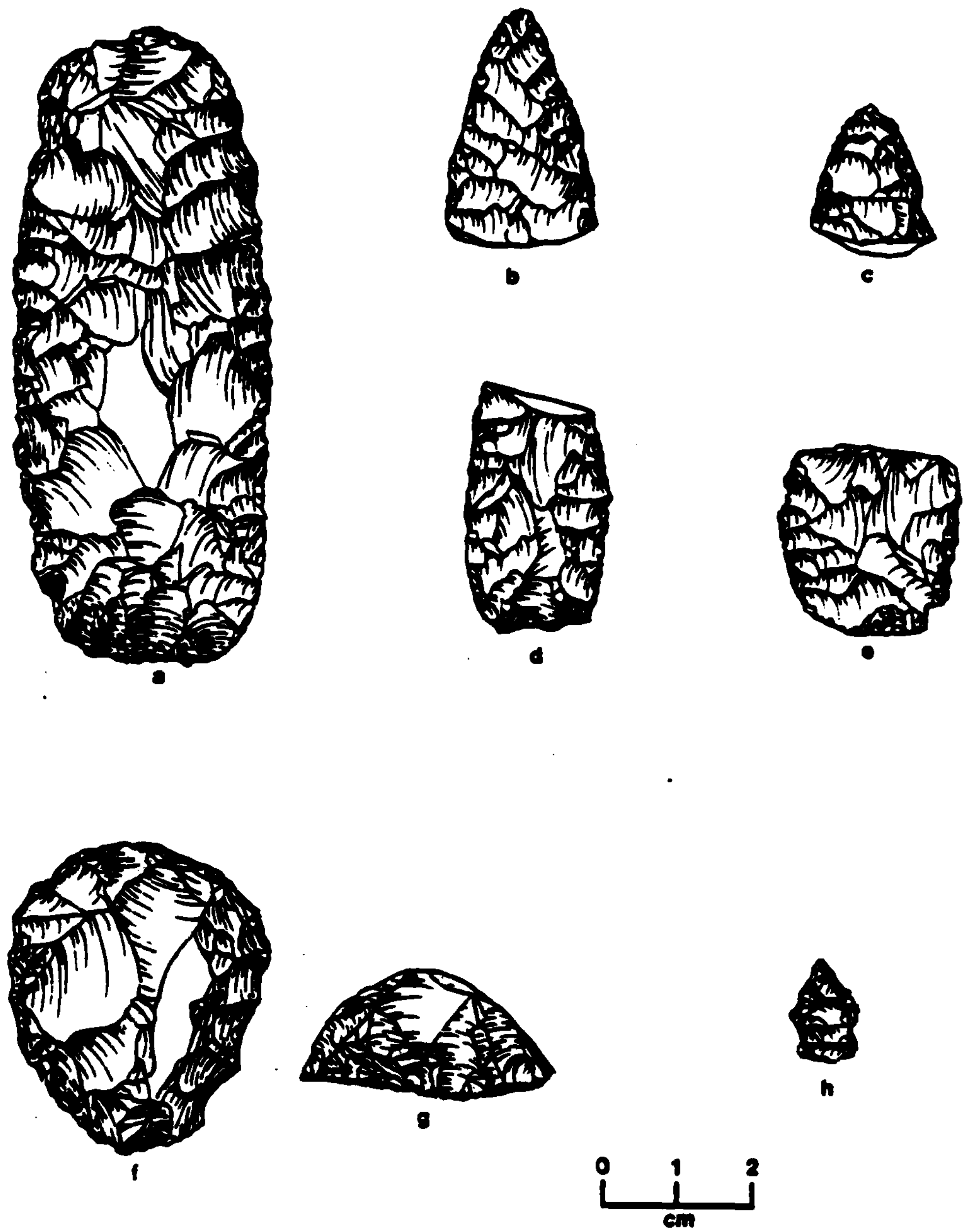

Figure 5.11. Lithic artifacts from 14BU57: (a-e) bifaces (a, A57020210001; b. A57050140001; c, A57050320002; d, A57020120001; e, A57090110001), (f-g) end scraper (f and g A57000050001), (h) drill (A57020130001).

Table 5.1. Descriptive Data for Bifaces (14BU57).

Artifact #	Chert*	Thermal Alter.	Lgth. (mm.)	Width (mm.)	Thk. (mm.)	Condition
A57020210001	2	Absent	86.3	33.8	9.4	Complete
A57010320001	3	Present	35.8	29.8	8.6	Tip
A57050140001	5	Present	32.0	20.0	5.3	Tip
A57050320002	1	Absent	19.6	15.1	6.2	Tip
A57020120001	2	Absent	33.5	18.6	6.0	Base
A57010320003	1	Present	42.8	42.7	10.0	Midsection
A57040340002	2	Absent	22.0	33.6	7.5	Midsection
A57050140002	3	Absent	35.8	27.1	15.3	Midsection
A57090110001	2	Absent	24.9	22.7	4.9	Midsection
A57000070004	2	Absent	41.5	59.8	15.7	Midsection
A57010210002	1	Present	48.6	28.7	17.1	Edge
A57040120004	1	Present	11.4	24.3	5.6	Edge
A57050110004	2	Absent	17.0	9.3	4.1	Edge
A57050140003	1	Present	11.0	15.5	5.0	Edge
A57070420001	2	Absent	24.1	21.3	6.8	Edge
A57100120004	1	Present	18.8	17.5	17.1	Edge
A57100120006	1	Present	6.8	15.0	4.8	Edge

* 1 - Florence A Chert, 2 - Florence B Chert, 3 - Flint Hills Light Gray Chert, 5 - Cresswell Chert

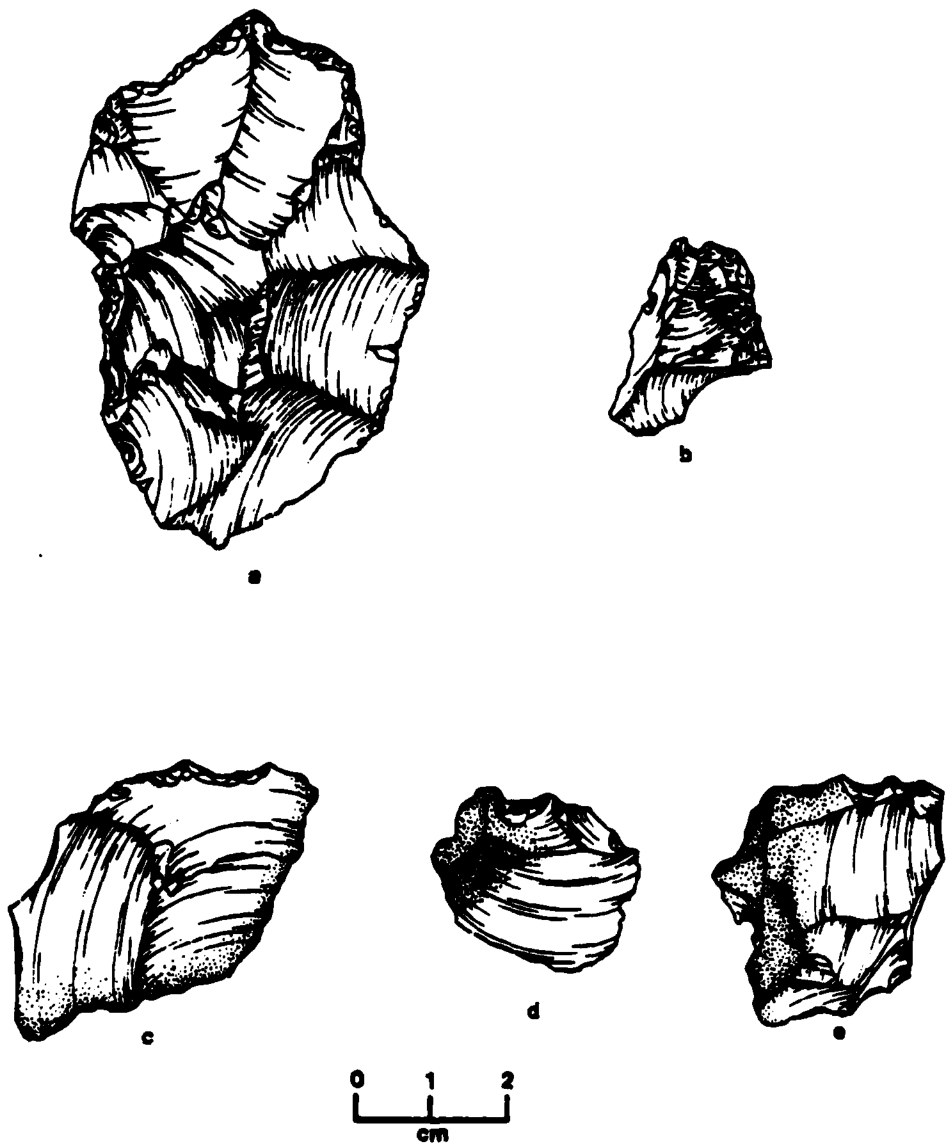

Figure 5.12. Lithic artifacts from 14BU57: (a-b) gravers (a, A57110230002; b, A57100130002), (c-d) notches (c, A57090140002; d, A57090320001), (e) denticulate (A57100140001).

Table 5.2. Descriptive Data for Gravers (14BU57)

Artifact #	Chert*	Thermal Alter.	Lgth. (mm.)	Width (mm.)	Thk. (mm.)	Blank Type
A57020120002	2	Absent	22.1	21.8	11.5	Shatter
A57100130002	1	Present	25.8	16.1	10.9	Shatter
A57110130002	1	Absent	22.4	17.8	4.4	Flake
A57110140001	1	Absent	22.5	19.8	4.5	Flake
A57110230002	1	Absent	66.7	47.0	16.0	Flake

* 1 - Florence A Chert, 2 - Florence B Chert

Table 5.3. Descriptive Data for Notches (14BU57)

Artifact #	Chert*	Thermal Alter.	Lgth. (mm.)	Width (mm.)	Thk. (mm.)	Blank Type
A57020340002	3	Absent	12.2	20.1	3.1	Flake
A57070120001	7	Absent	19.4	12.7	5.0	Pebble
A57090140002	1	Present	30.1	33.8	15.1	Flake
A57090320001	1	Absent	22.8	26.6	6.0	Flake
A57000070003	3	Absent	35.8	20.1	5.3	Flake

* 1 - Florence A Chert, 3 - Flint Hills Light Gray Chert, 7 - Indeterminate Chert

from the surface, just south of unit 1. It has been made on the dorsal surfaces of a unifacially modified flake of Flint Hills Light Gray chert. The retouch is invasive. It is plano-convex in cross section. The convex lateral edges expand toward the distal end which is rounded. This working edge exhibits step fractures (Fig. 5.11g), indicating its probable usage in heavy boneworking and/or woodworking activities (Wilmsen 1968:159). It is 40.2 mm. long, 33.6 mm. wide, and 15.4 mm. thick.

The remaining three specimens are actually end scraper resharpening flakes.

Drill (N=1)

One complete, small drill, A57020130001 (Fig. 5.11h), was recovered. It is made of thermally altered Florence A chert. It has a hafting element consisting of a convex base and shallow corner-notches. The working bit has two alternating beveled edges. The size and condition indicate that it is an exhausted drill. It measures 13.3 mm. long, 8.8 mm. wide, and 3.6 mm. thick.

Gravers (N=5)

The specimens in this category have sharp, pronounced, angular protrusions formed by marginal retouch (Fig. 5.12a-b). Three specimens are made on flakes and two are made on shatter. Descriptive data are presented in Table 5.2.

Notches (N=5)

The artifacts in this category exhibit marginal retouch producing a single concavity along an edge (Fig. 5.12c-d). Four of the notches are made on flakes and the fifth is on a pebble. Descriptive data are listed in Table 5.3.

Denticulates (N=2)

The tools in this category have marginal retouch resulting in two or more contiguous notches along an edge. Specimen A57100140001 (Fig. 5.12e) is made on a flake of Florence B chert. Two contiguous notches are present along one lateral edge and a lateral snap has cut off a third notch. It is 31.8 mm. long, 29.5 mm. wide, and 8.0 mm. thick. The second denticulate, A57020330003, is made on a piece of shatter of Florence B chert. It has three contiguous notches and it measures 52.4 mm. long, 26.4 mm. wide, and 15.6 mm. thick.

Composite Tools (N=7)

These tools have two or more distinct working edges produced by marginal retouch. Descriptive data are listed in Table 5.4.

Marginally Retouched Flakes (N=22)

Specimens in this category exhibit continuous and discontinuous marginal modification which does not conform to any of the above tool categories. These artifacts are irregular in shape. The retouch is usually fine and confined to an area on an edge, rarely extending along an entire edge. Descriptive data are presented in Table 5.5.

Marginally Retouched Shatter (N=5)

This category is identical to the last one except that the modification occurs on shatter rather than flakes. In all other aspects the two categories are similar. Descriptive data are presented in Table 5.6.

Cores (N=2)

Specimen A57010120001 is a small, exhausted, prepared core made of Florence B chert. It has a single platform. Patterned flake removal is indicated by the parallel alignment of flake scars. It measures 11.7 mm. long, 12.1 mm. wide, and 11.5 mm. thick. It weighs 1.7 g.

Specimen A57060110002 is a multi-directional, unprepared core. As a consequence, the alignment of flake scars is unpatterned. Hinge fractures are present. The core is made from thermally altered Florence A chert which exhibits signs of frost-pitting. It measures 37.5 mm. long, 29.4 wide, and 19.7 mm. thick. It weighs 19.5 g.

Sandstone (N=1)

A single piece of unworked, calcareous sandstone, A5702012, was recovered from the plowzone. It weighs 2.8 g. The source of the sandstone is not known (Haury, Personal Communication). It does not occur naturally at the site. Its association with a historic or prehistoric occupation is unknown. Two pieces of sandstone were also recovered from the plowzone in 1977 (Leaf 1979:122).

Limestone

A total of 2453.2 g. of burned limestone and 4146.8 g. of unburned limestone was recovered from the block excavation.

Discussion

The morphology of the lithic tools are indicative of subsistence activities. The biface and end scraper resharpening flakes suggest that maintenance of stone tools occurred at the site. Of the tools, 61% are broken, suggesting that the area may have been used as a refuse area rather than a habitation area.

Lithic tools for which exact provenience has been recorded are plotted in Fig. 5.13. The distribution of lithic tool counts for levels 2 (99.70-99.60 m.) and 3 (99.60-99.50 m.) are presented in Fig. 5.14. As these figures indicate, a concentration of tools is present at the west end of the excavation. Debitage frequency distributions (Figs. 5.15

Table 5.4. Descriptive Data for Composite Tools (14BU57)

Artifact #	Chert*	Thermal Alter.	Lgth. (mm.)	Width (mm.)	Thk. (mm.)	Blank Type
A57020120003	2	Absent	30.5	25.5	6.3	Flake
A57020120004	3	Absent	25.2	21.4	4.6	Flake
A57020130002	2	Absent	21.0	34.6	7.2	Flake
A57060130002	1	Absent	26.9	15.3	4.1	Flake
A57100120001	2	Absent	13.9	18.1	6.1	Flake
A57100130003	2	Absent	36.7	25.7	12.9	Flake
A57110130001	7	Present	29.9	28.6	4.3	Flake

* 1 - Florence A Chert, 2 - Florence B Chert, 3 - Flint Hills Light Gray Chert, 7 - Indeterminate Chert

Table 5.5. Descriptive Data for Retouched Flakes (14BU57)

Artifact #	Chert*	Thermal Alter.	Lgth. (mm.)	Width (mm.)	Thk. (mm.)
A57010130001	3	Absent	28.5	24.6	6.0
A57010310002	2	Present	13.6	18.3	5.2
A57010340002	2	Absent	24.4	22.8	9.5
A57010410002	2	Absent	30.3	28.4	6.5
A57010510002	2	Absent	46.8	22.5	3.1
A57040120002	2	Absent	20.2	16.1	6.3
A57020420001	2	Present	21.2	14.7	3.0
A57040120003	7	Absent	31.6	17.4	7.4
A57040130002	2	Absent	36.4	40.1	11.2
A57040210001	2	Present	43.1	23.7	6.4
A57050120001	2	Absent	21.9	20.6	4.2
A57060130003	4	Absent	16.5	26.5	7.4
A57070230001	2	Absent	28.8	27.1	2.9
A57080130001	2	Absent	40.4	21.3	10.2
A57080230001	2	Absent	36.5	30.8	7.7
A57090130001	2	Present	27.2	20.4	5.1
A57100110001	3	Absent	12.0	14.9	4.6
A57100120003	7	Absent	14.1	7.4	4.1
A57100140002	3	Absent	15.7	14.8	5.0
A57000050003	7	Absent	42.0	28.6	7.5
A57000070002	1	Present	36.2	27.5	15.2
A57000070005	2	Absent	19.5	22.9	6.2

* 1 - Florence A Chert, 2 - Florence B Chert, 3 - Flint Hills Light Gray Chert, 4 - Flint Hills Green Chert, 7 - Indeterminate Chert

Table 5.6. Descriptive Data for Retouched Shatter (14BU57)

Artifact #	Chert*	Thermal Alter.	Lgth. (mm.)	Width (mm.)	Thk. (mm.)
A57010140002	2	Present	26.1	17.0	16.3
A57040120001	1	Absent	64.5	40.5	18.4
A57050210001	2	Absent	41.9	32.0	22.8
A57070120002	2	Absent	74.9	63.9	33.7
A57100220001	2	Absent	31.1	25.3	9.1

* 1 - Florence A Chert, 2 - Florence B Chert

through 5.17) indicate a second concentration of lithic material occurs at the east end of the excavation, in the vicinity of Feature 1. The two areas of concentration are separated by unit 6 which is nearly devoid of lithic tools and debitage.

Burned limestone was concentrated in two areas (Figs. 5.18 and 5.19). Although they are not associated with hearths or roasting pits, they may have been used in that context, or they may also have been used as boiling stones. No conclusive data are available. Unburned limestone was clustered near the center of the excavation (Fig. 5.20).

In addition to concentrations of material, the distribution maps also indicate that most of the undisturbed cultural zone was contained within level 2 (99.70-99.60 m.). Level 3 (99.60-99.50 m.) contained a marked decrease in cultural material, indicating that the bottom of the occupation had been encountered.

Ceramic Assemblage

The ceramic assemblage consists of 28 sherds. Only one rim sherd is present in the collection. All sherds were recovered from the block excavation.

Temper: The most common temper is limestone, occurring in 21 sherds. One is tempered with crushed granite and one is tempered with crushed quartzite. The temper in the remaining 5 sherds is indeterminate due to their small size and eroded condition.

Color: All sherds fall within the YR range of the Munsell Soil Color Series. All exterior colors fall within the 10YR group. Shades of brown and gray are the most common. Interior colors fall within the 7.5 YR and 10YR groups. Dark brown and very dark grayish browns are the most common.

Carbon Streak: A carbon streak is present in all sherds indicating that they were fired in a reducing atmosphere (Shepard 1956:105). Organic matter in the clay was incompletely oxidized during firing.

Finishing Technique: The presence of cordmarking on sherd exteriors and anvil indentations on sherd interiors indicates that the finishing technique was paddle-and-anvil.

Exterior Surface Treatment: Smoothed over cordmarking is present on 17 sherds (Fig. 5.21 a-c). Seven sherds are cordmarked without smoothing (Fig. 5.21 d-e). Due to their small size, the exterior surface treatment of the remaining 4 sherds is indeterminate.

Interior Surface Treatment: All interior surfaces have been smoothed.

Form: No restorable vessels were found. The shape of the vessels is unknown, but the single straight rim sherd, A57060210007 (Fig 5.21 a), suggests a vessel with an ill-defined, slightly constricted neck. Further

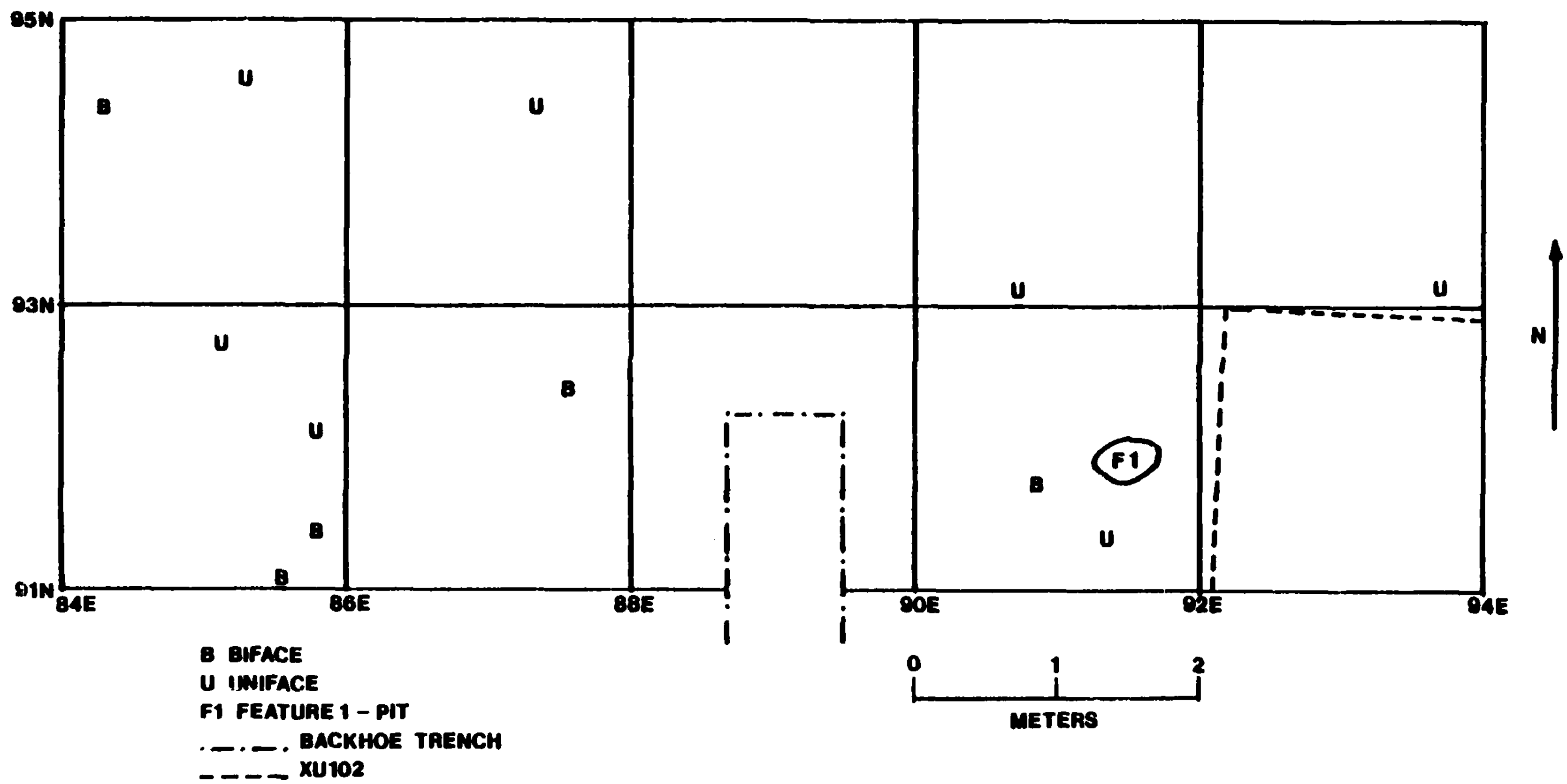

Figure 5.13. Distribution of plotted lithic tools (14BU57).

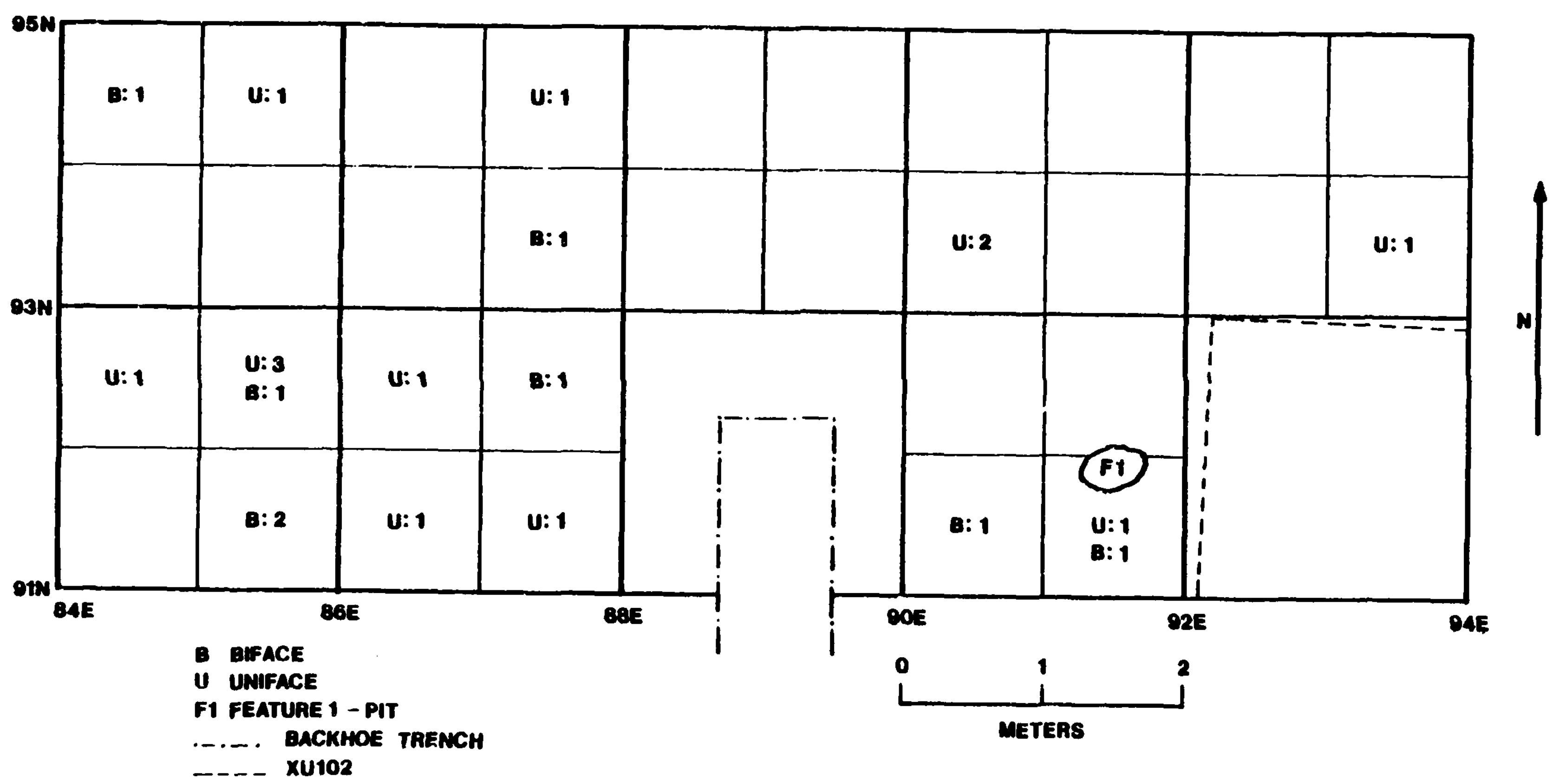

Figure 5.14. Distribution of lithic tool counts for levels 2 (99.70-99.60) and 3 (99.60-99.50) (14BU57).

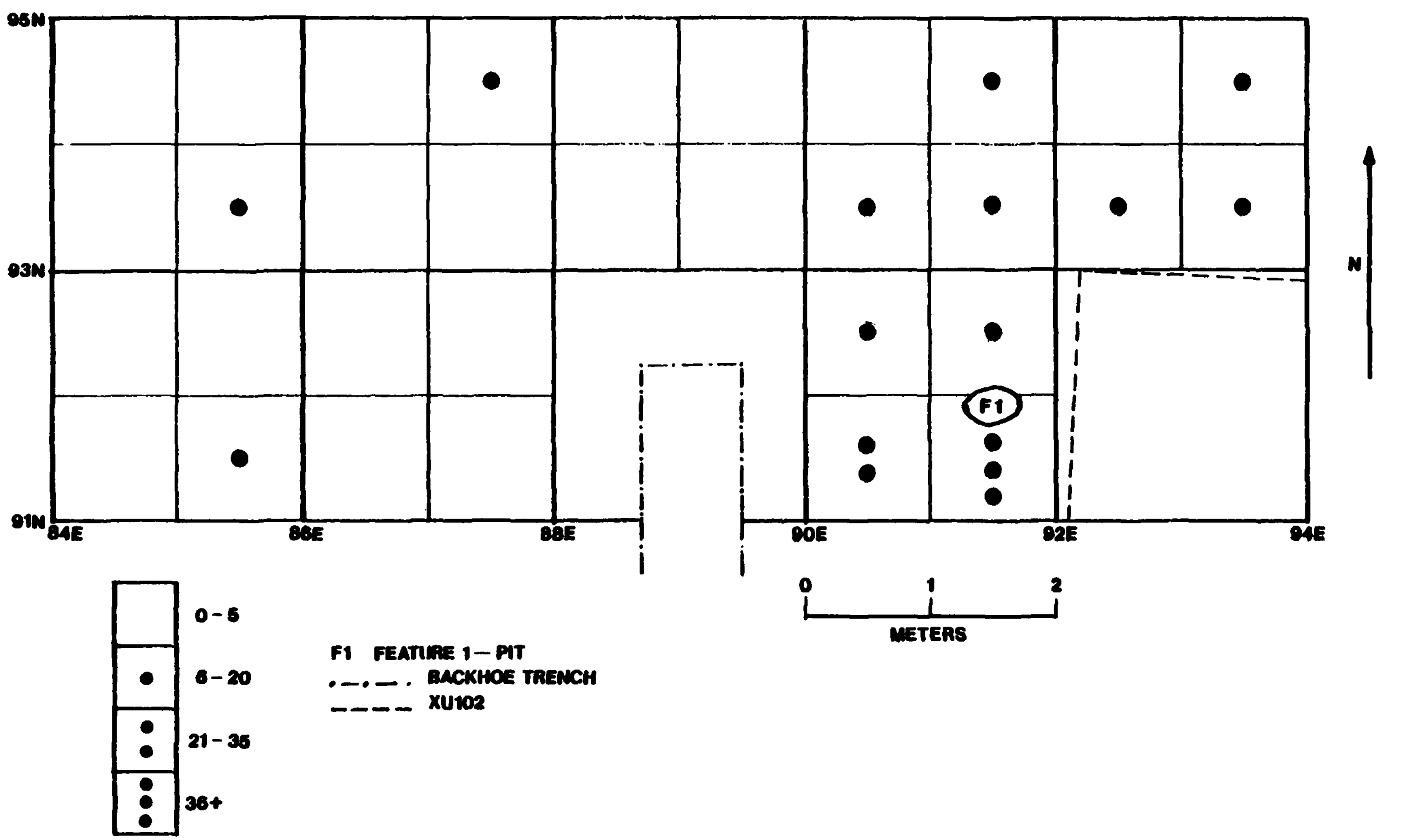

Figure 5.15. Frequency distribution of debitage for level 2 (99.70-99.60) (14BU57).

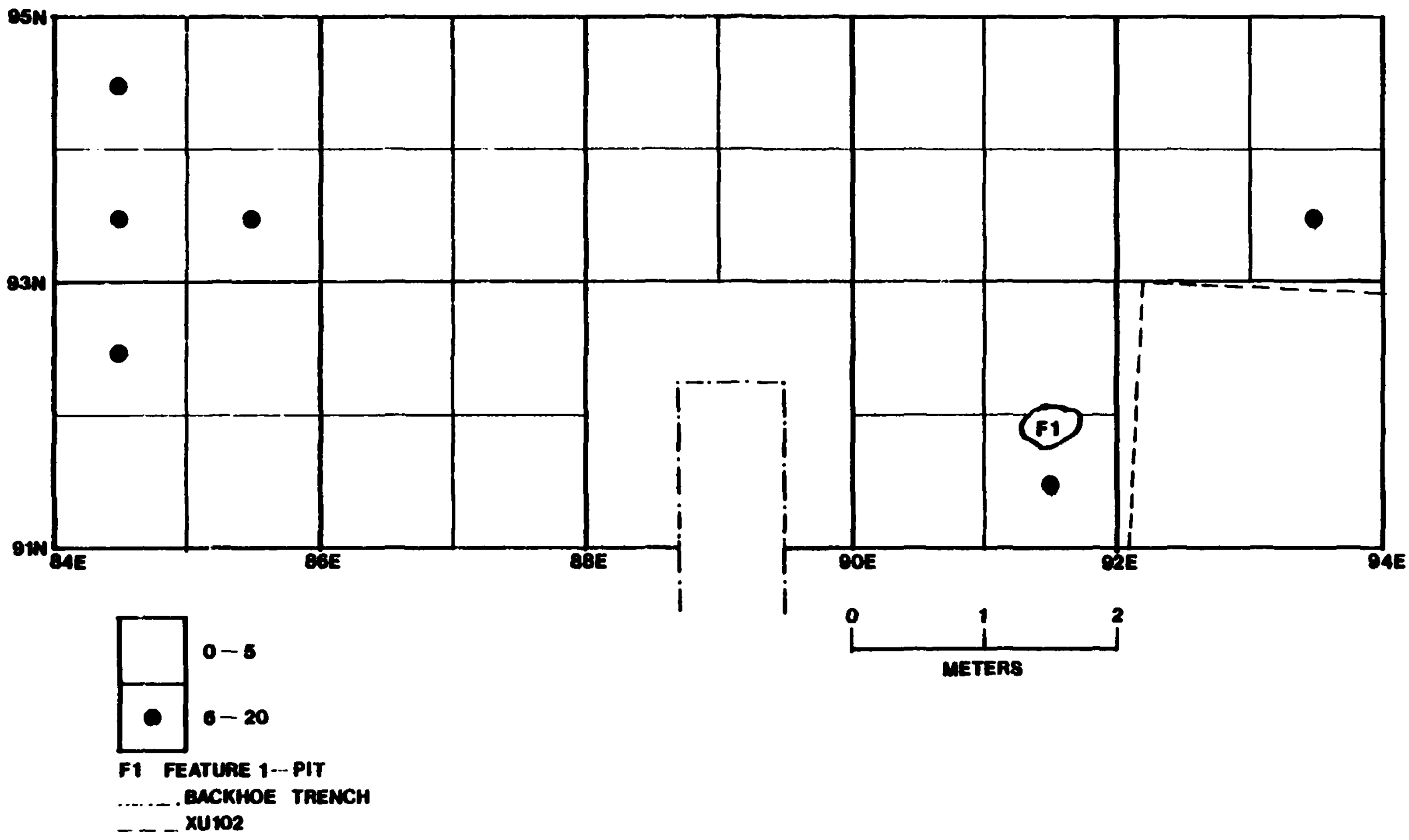

Figure 5.16. Frequency distribution of debitage for level 3 (99.60-99.70) (14BU57).

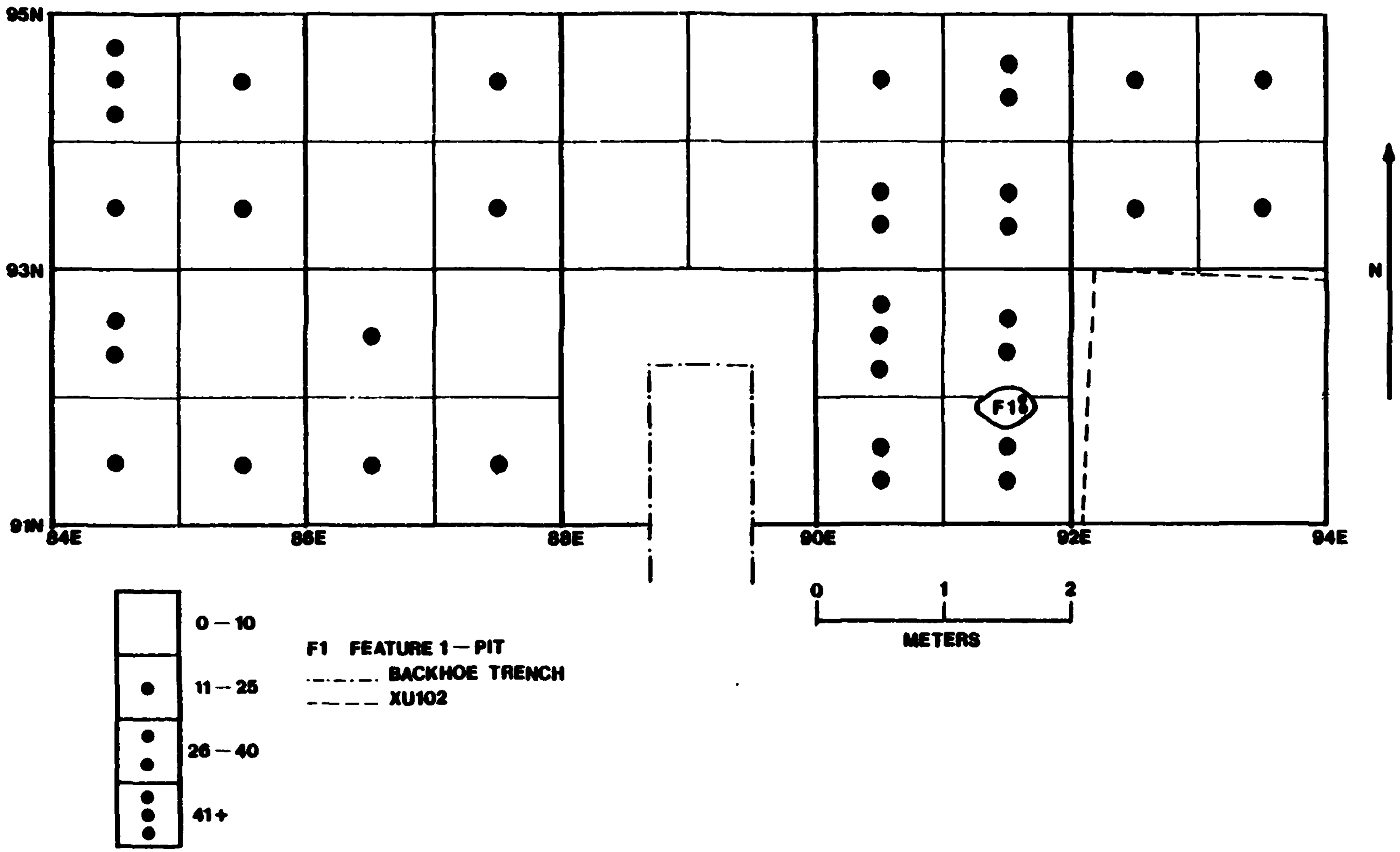

Figure 5.17. Frequency distribution of debitage recovered from flotation, levels 2 and 3 (14BU57).

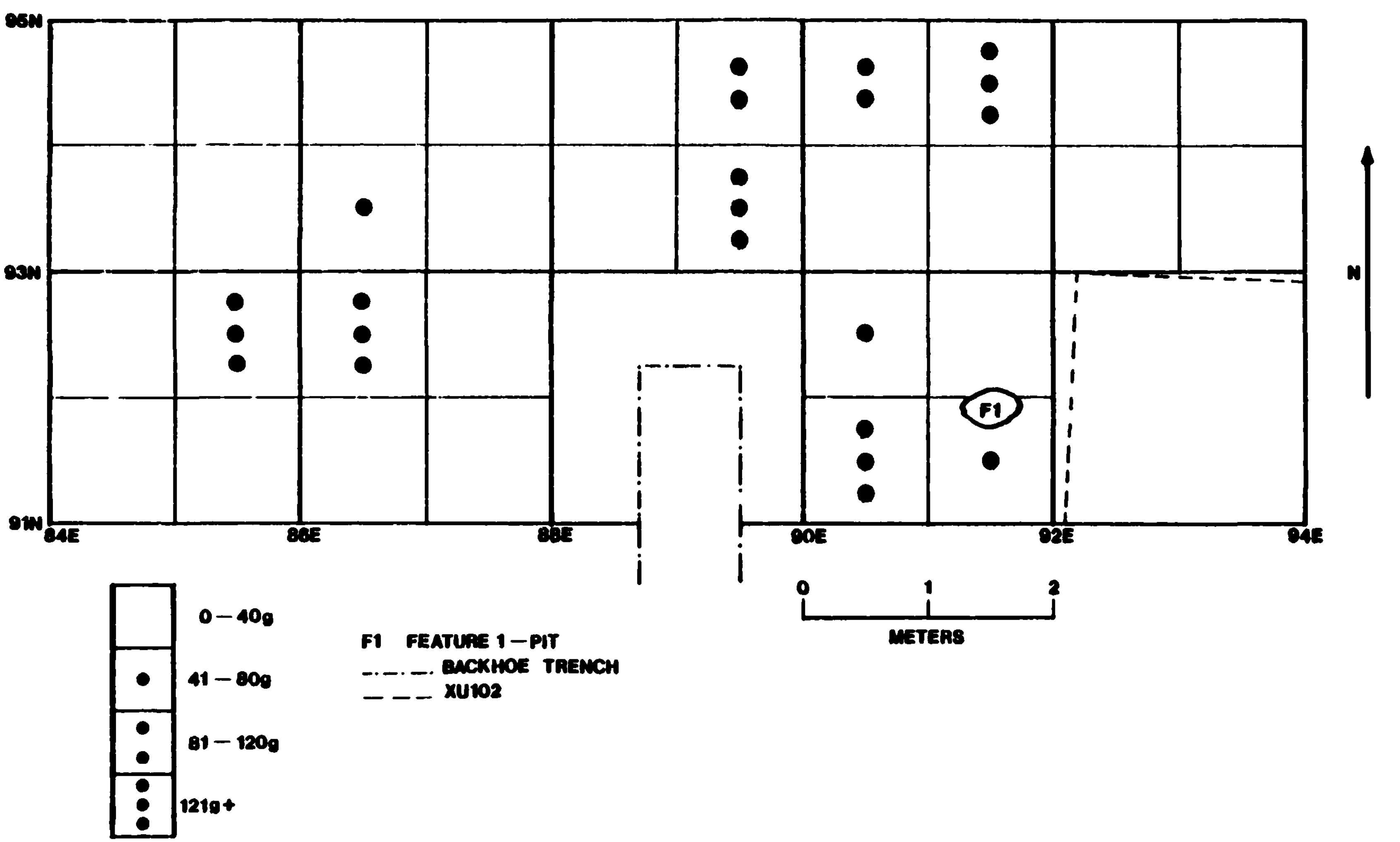

Figure 5.18. Frequency distribution of burned limestone for level 2 (99.70-99.60) (14BU57).

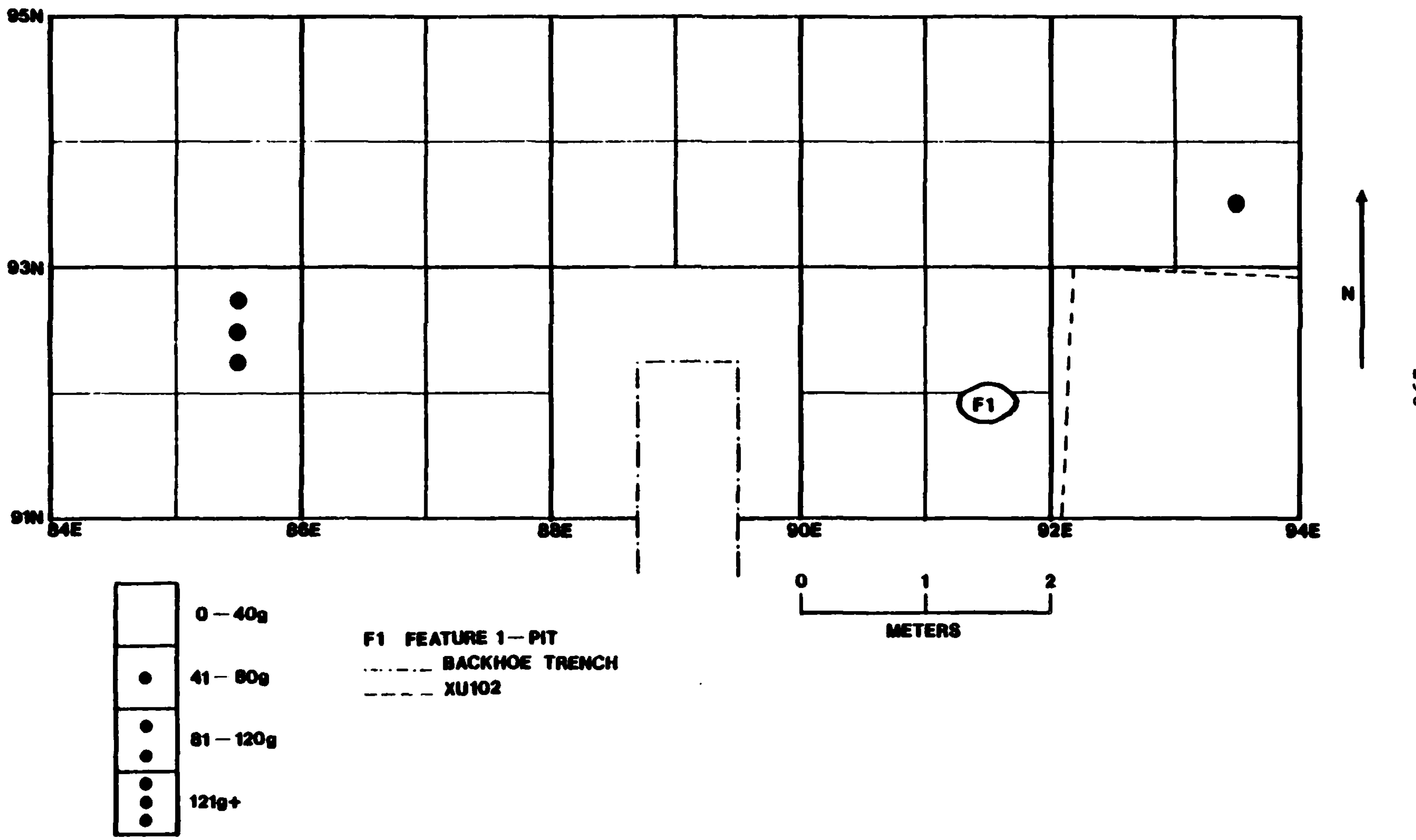

Figure 5.19. Frequency distribution of burned limestone for level 3 (99.60-99.50) (14BU57).

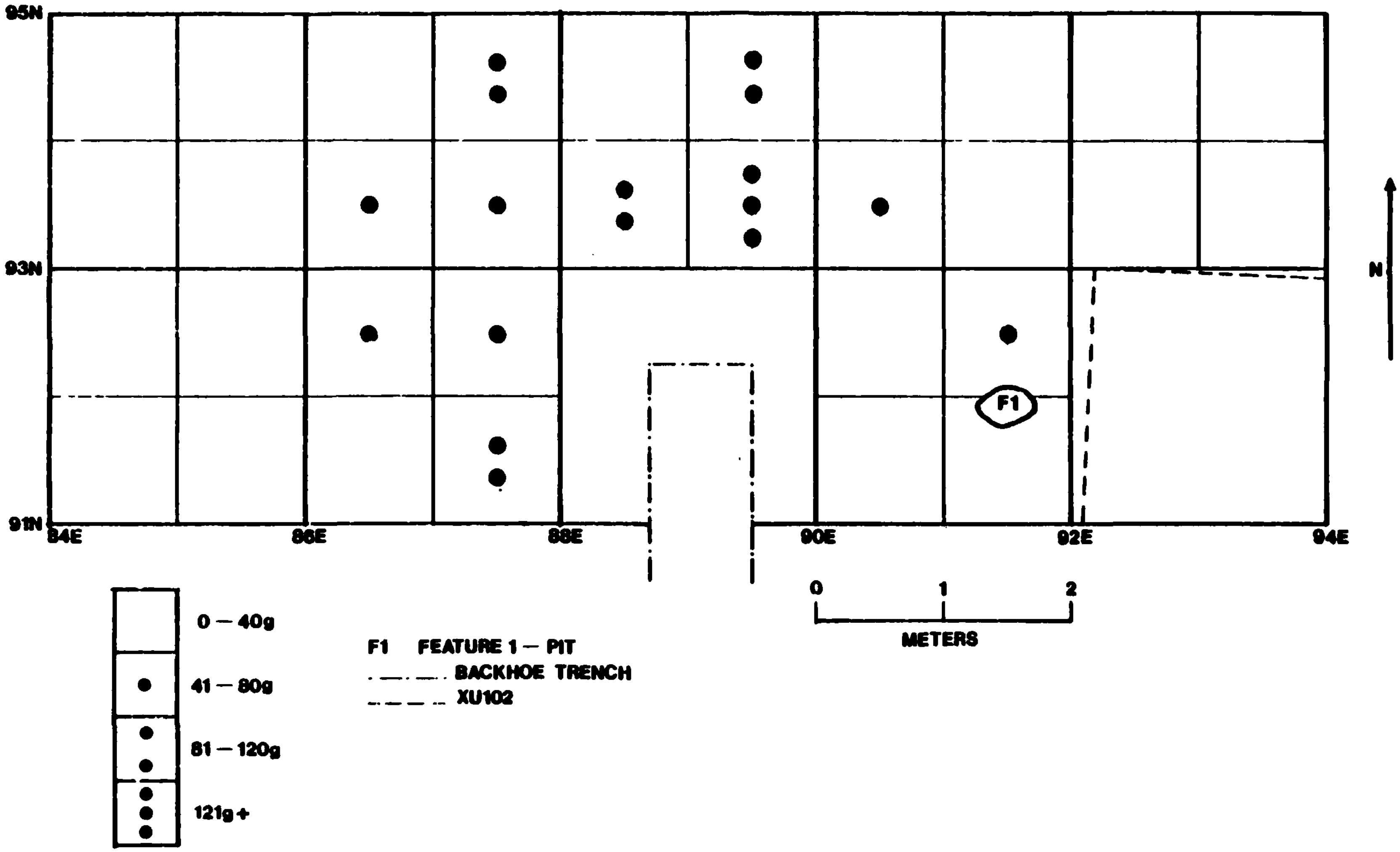

Figure 5.20. Frequency distribution of unburned limestone for level 2 (99.70-99.60) (14BU57).

data on vessel shape are lacking. The rim sherd is 56.2 mm. high and it has a flat lip.

Discussion

With the exception of the two sherds tempered with crushed granite and quartzite, the pottery from site 14BU57 is assigned to the Verdigris ceramic type as defined by Calabrese (1967:58-60). This designation of the sherds is based primarily on limestone temper, exteriors with smoothed over cordmarks, and the single, straight rim sherd.

Exact provenience data were recorded for 14 of the 17 subplowzone sherds. These are plotted in Fig. 5.22. As indicated, there is a single concentration of pottery in unit 6. This is the area separating the two areas of lithic concentration referred to previously (Figs. 5.13 through 5.17). Although evidence is not conclusive, it is suggested that the concentration of subplowzone sherds in unit 6 and its immediate vicinity, only, is due to refuse disposal. No other activity is indicated.

Faunal Assemblage

Bone Bead (N=1)

A single, tubular, bird bone bead was recovered (A57100220004, Fig. 5.21f). Both ends exhibit evidence of having been grooved-and-snapped. A portion of one end has been smoothed. The bead measures 19.0 mm. long and has a diameter of 6.2 mm.

Discussion

A total of 48 identifiable bones, representing 16 taxonomic groups, was recovered (Table 5.7). Almost all of the bones of the smaller animals were retrieved from flotation. Identifications were made by comparing the archaeological specimens to various osteological collections curated in the Museum of Natural History, University of Kansas.

The mole and rodents are considered to be intrusive. Deer, fish, birds, and possibly cottontail were probably consumed as food. Butchering, in the form of cut marks, is present on four deer bones. The sample of deer elements (N=9) contains 8 lower leg bones. These bones contain little or no meat and marrow. They were probably discarded during the butchering process. This also suggests that the block excavation was a refuse area.

Floral Assemblage

A total of 18 genera of charred floral remains was recovered from flotation (Table 5.8). All floral remains were identified by H.A. (Steve) Stephens. Horticulture is indicated by a single kernel fragment of Zea mays. It has been identified as a nonmodern corn. In itself, this fragment is not conclusive evidence for prehistoric agriculture at the site, but it does indicate that the inhabitants did have access to horticultural

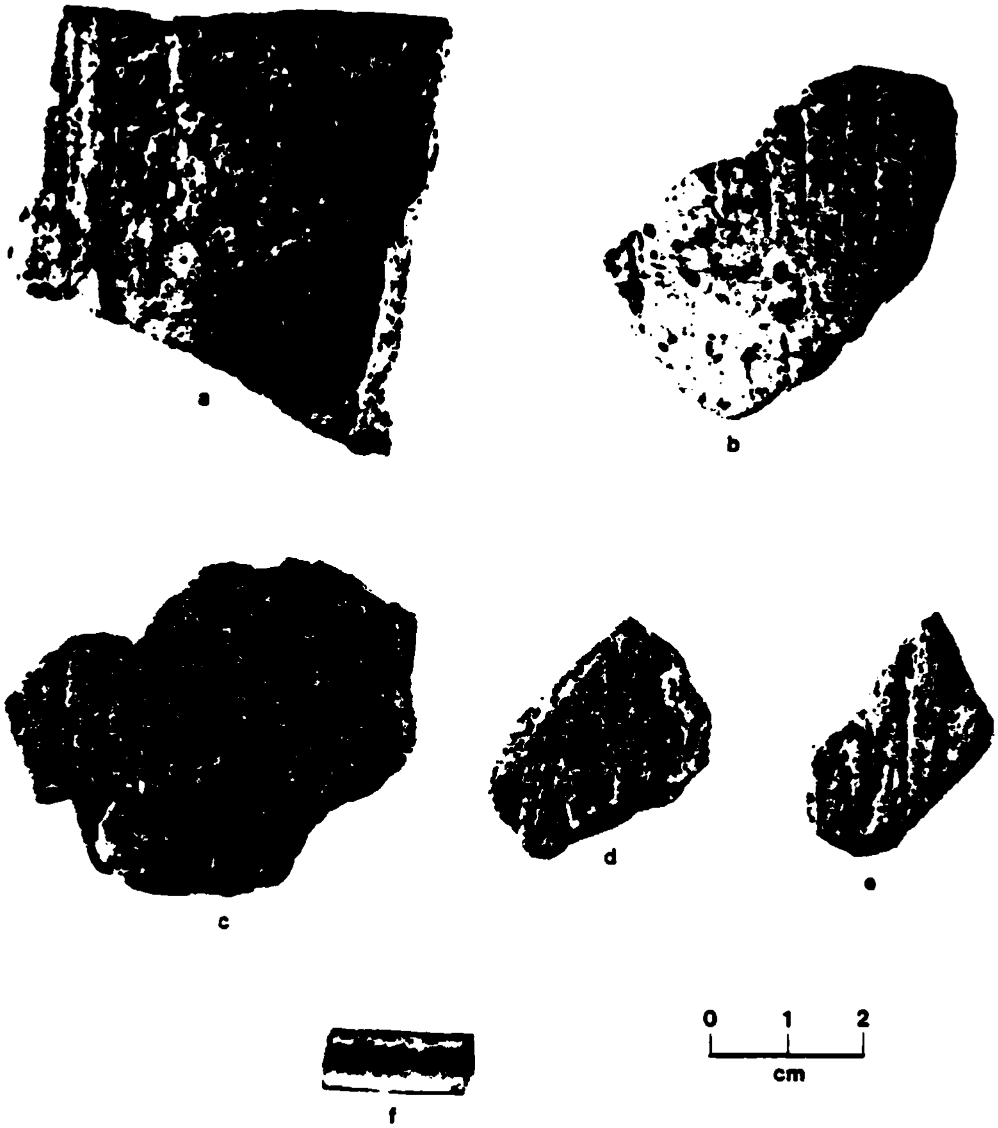

Figure 5.21. Ceramic and bone artifacts from 14BU57: (a) rim sherd (A57060210007), (b-c) smoothed over cordmarked sherds (b, A57060210001; c, A57060220001), (d-e) cordmarked sherds (d, A57010140003; e, A57010120003), (f) bone bead (A57100220004).

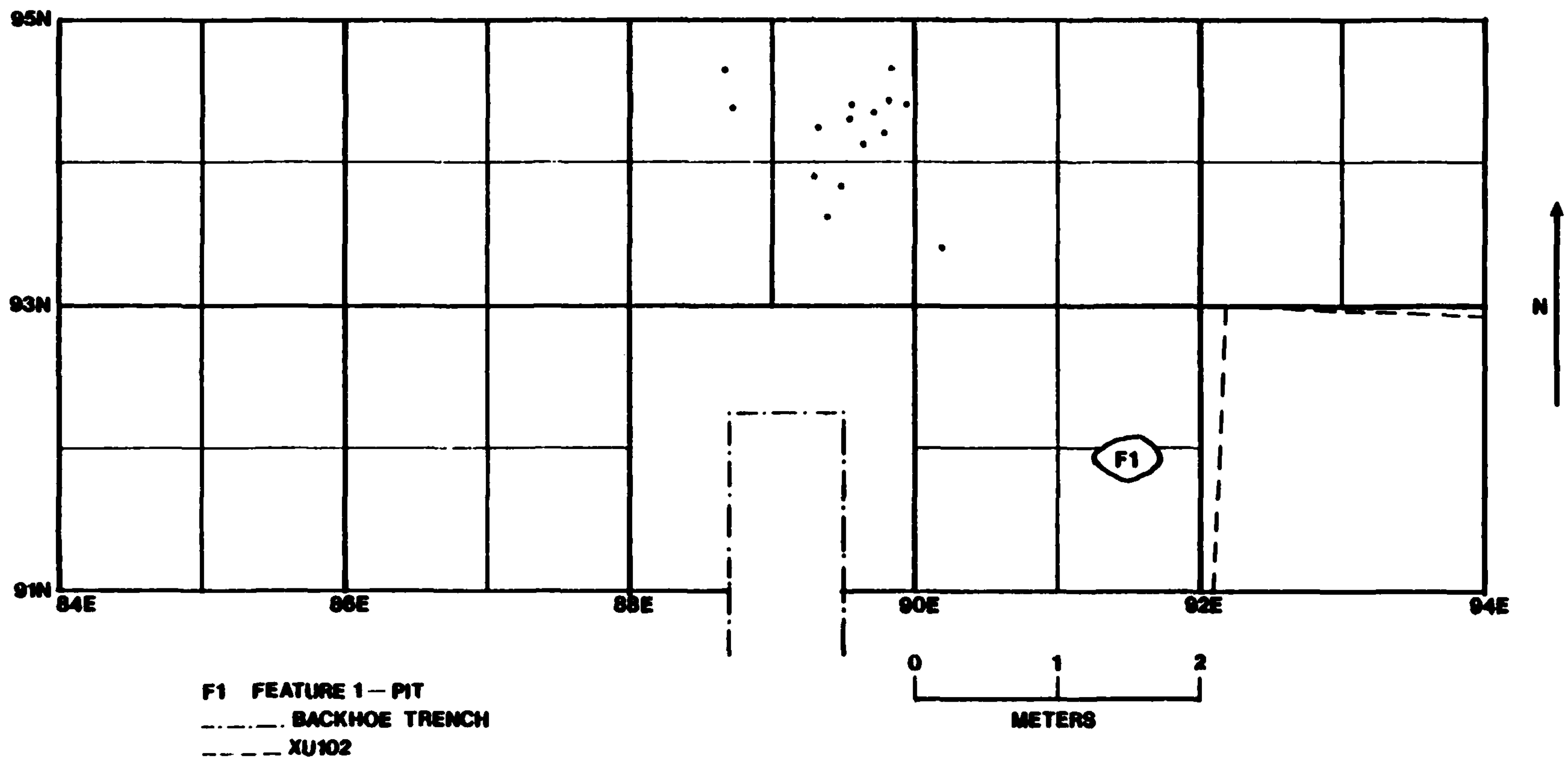

Figure 5.22. Distribution of plotted pottery (14BU57).

Table 5.7. Identifiable Faunal Remains (14BU57)

	Element	Side	Condition
Odocoileus sp. (Deer)			
A57050110006	M_3	Right	Labial
A57050110001*	Femur	Right	Distal Epiphysis
A57050110002*	Femur	Right	Distal Diaphysis
A57090140001	Metatarsal	?	Shaft
A57090120004	Accessory Carpal	Right	Complete
A57010110001	Carpal	Left	Complete
A57090120003**	Carpal	Right	Complete
A57090120001**	Fused 2nd & 3rd Carpal	Right	Complete
A57080220002	1st Phalange	Left	Distal
Sylvilagus sp. (Cottontail)			
A57100110005	Mandible w/P_4	Right	Midsection
A57010240004	Femur	Right	Distal
Scalopus aquaticus (Mole)			
A57050210004	Femur	Right	Complete
A57080320002	Ungual Phalanx	Right	Complete
A57080320003	Carpal	Right	Complete
A57090230001	Humerus	Left	Distal
Microtus ochrogaster (Prairie Vole)			
A57040230002	M_1	Left	Complete
A57060220005	M^1	Right	Posterior
A57090210002	M_1	Right	Complete
A57090320003	M^1	Right	Complete
A57080310002	M_1^1	Right	Complete
A57010310003	M_2 M^1	Left	Complete
A57010220003	M^2	Left	Complete
A57020220002	M_2	Left	Complete
A57020220003	M^2	Right	Complete
A57010320004	Lower Incisor	Left	Distal
A57060220006	Lower Incisor	Right	Distal
A57100320002	Upper Incisor	Right	Distal
A57010240002	Mandible w/M_2	Left	Anterior
A57010240003	Humerus	Right	Shaft
A57040240002	Femur	Left	w/o Distal Epiphsis
A57060320003	Astragalus	Left	Complete
A57100340002	Astragalus	Left	Complete
A57110220002	Astragalus	Right	Complete
Peromyscus sp. (Mouse)			
A57060240004	Mandible	Right	Anterior
A57050220002	Maxilla w/M^1	Right	Anterior
A57060240003	Femur	Right	Proximal
Blarina brevicauda (Short-tailed Shrew)			
A57010220002	Maxilla	Left	Posterior

Table 5.7. (Continued)

	Element	Side	Condition
Sciuridae (Squirrel)			
A57090240002	Upper Tooth	?	Complete
Geomys bursarius (Pocket Gopher)			
A57090220002	Mandible w/teeth	Left	Anterior
Dipodomys ordii (Kangaroo Rat)			
A57100230003	Upper Incisor	Right	Complete
A57100230004	Humerus	Right	w/o Prox. Epiphysis
Neotoma sp. (Wood Rat)			
A57060340002	M^3	Left	Complete
Phenacomys intermedius			
A57010310004	M_1	Right	Anterior
Cricetidae (Native Rats and Mice)			
A57090330002	Upper Incisor	Left	Distal
Serpentes (Snake)			
A57040240003	Vertebra	Axial	Incomplete
Ictalurus sp. (Catfish)			
A57040230003	Cleithrum	Left	Posterior
Pisces (Fish)			
A57090210003	Scale	?	Posterior
Passeriformes (Perching Birds)			
A57050220003	Humerus	Left	Proximal

* Articulate
** Articulate

Table 5.8. Identified Charred Floral Remains (14BU57)

Family	Genus	Common Name	Total
Aizoaceae	*Mollugo verticillata*	Carpet Weed	1
Amaranthaceae	*Amaranthus* spp.	Pigweed	4
Boraginaceae	*Lithospermum arvense*	Corn Gromwell	1
Caryophyllaceae	*Cerastium nutans*	Chickweed	1
Chenopodiaceae	*Chenopodium hybridum*	Goosefoot	2
Chenopodiaceae	*Chenopodium* spp.	Goosefoot	1
Compositae	*Ambrosia artemisiifolia*	Ragweed	1
Euphorbiaceae	*Euphorbia dentata*	Spurge	6
Euphorbiaceae	*Euphorbia* spp.	Mat Spurge	6
Fagaceae	*Quercus* spp.	Oak	meat 1, shell 2
Iridaceae	*Sisyrinchium* sp.	Blue-eyed Grass	1
Juglandaceae	*Carya* spp.	Hickory	shell 9
Juglandaceae	*Juglans nigra*	Black Walnut	meat 2, shell 4
Phytolaccaceae	*Phytolacca americana*	Pokeweed	2
Rosaceae	*Rubus* spp.	Blackberry	1
Rubiaceae	*Galium* spp.	Bedstraw	1
Vitaceae	*Vitis* sp.	Grape	1
Gramineae	*Zea mays*	Corn	1

products, either through trade or growing their own crops.

The nuts of Carya spp., Juglans nigra, and Quercus spp. were probably part of the diet. In addition, other plant foods probably included Vitas sp., Chenopodium hybridum, Phytolacca americana, and Rubus spp. Vitas sp. and Phytolacca americana may also have been used as dyes (Asch, et. al. 1972: 17-18). These floral remains indicate that the site was occupied at least in late summer and early autumn.

Burned Earth and Daub

Burned earth was encountered in all levels throughout the block excavation. Three specimens of burned earth (0.6g.) which exhibit grass impressions are classified as daub. It is believed that erosion has obliterated grass and twig impressions on other pieces of burned earth which might otherwise have been classified as daub.

Similar to the lithic tools and debitage, the burned earth is concentrated in two areas (Figs. 5.23 and 5.24). The heaviest concentration is in the vicinity of Feature 1. The former presence of a nearby structure is suggested.

Charcoal

Although charcoal was scattered throughout the block excavation, two areas of concentration are reflected by the flotation samples (Fig. 5.25). These concentrations follow the same previously described pattern.

Radiocarbon Date

A subplowzone, composite charcoal sample from unit 5 was submitted to the Geochronology Laboratory of the University of Georgia for radiocarbon dating. A date of 755±235 B.P. or A.D. 1195 (UGa-3137) was obtained (Brandau, Personal Communication). This is an uncorrected date based on a half-life of 5568 years. The corrected date is 759±30 B.P. or A.D. 1191 (Damon, et. al. 1974:352).

Summary and Conclusions

Site 14BU57 is situated near the confluence of Satchel Creek with the Walnut River. It covers an area of 0.26 hectare. The site was first surveyed and tested in 1974, surface collected in 1975, and tested again in 1977. In the summer of 1979 larger-scale excavations were undertaken to determine if two distinct components, Late Woodland and Plains Village, are present. The excavations were also undertaken in an effort to define structures and activity areas. The data obtained from such areas would add valuable information to the knowledge of the prehistoric settlement patterns, seasonality, subsistence, butchering patterns, and lithic technology of the Ed Dorado area in general.

The block excavation indicated that a single component occupation

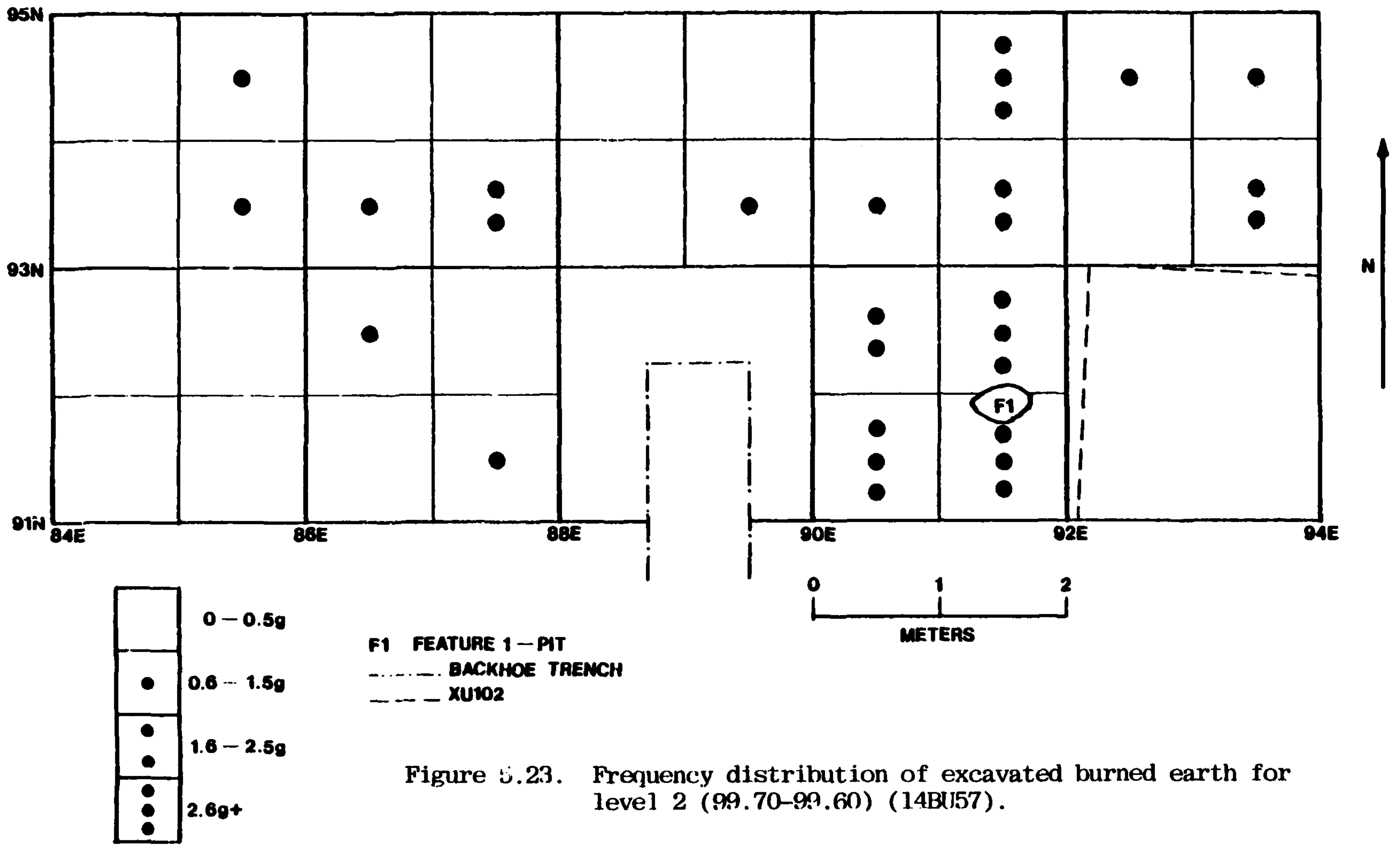

Figure 5.23. Frequency distribution of excavated burned earth for level 2 (99.70-99.60) (14BU57).

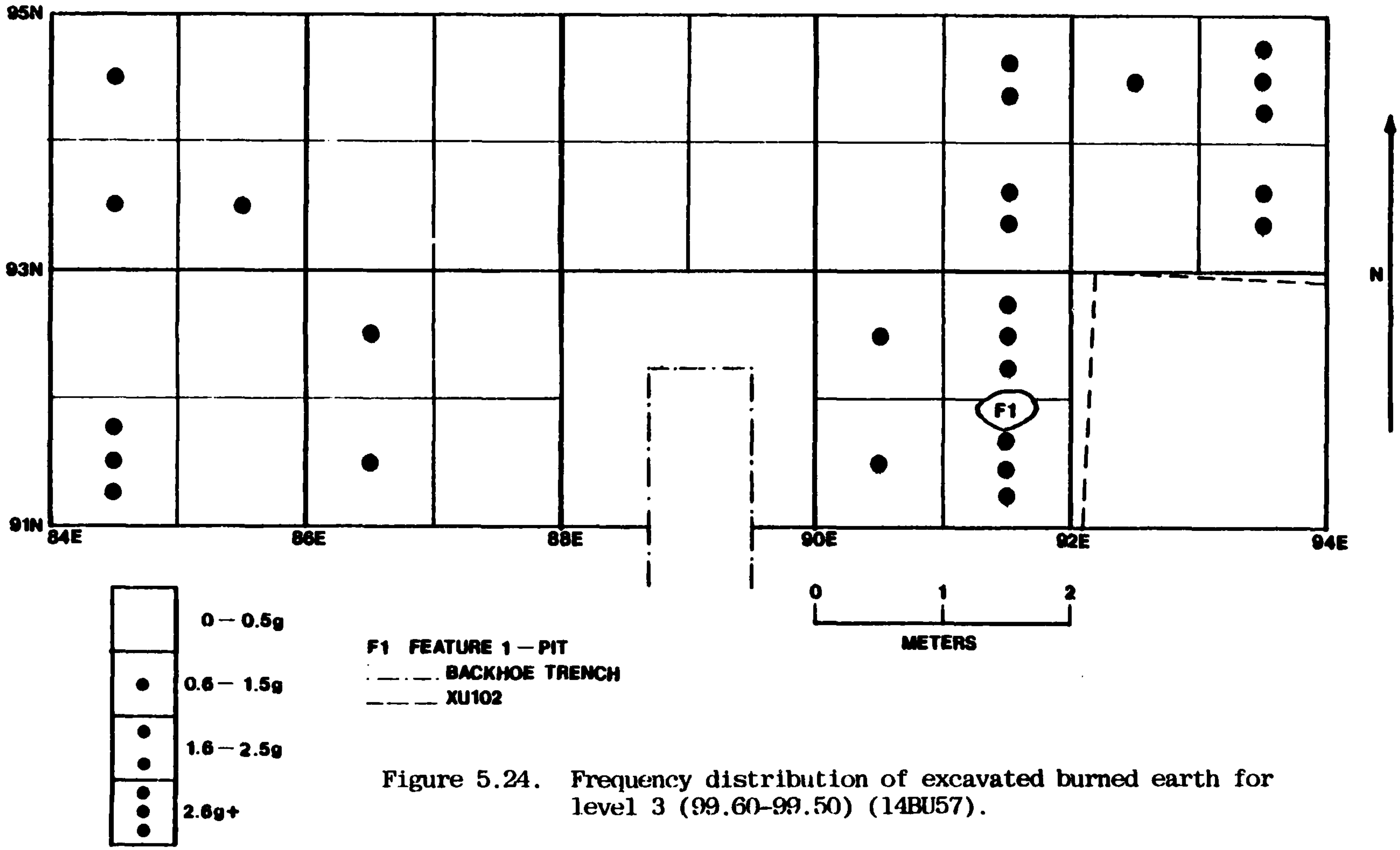

Figure 5.24. Frequency distribution of excavated burned earth for level 3 (99.60-99.50) (14BU57).

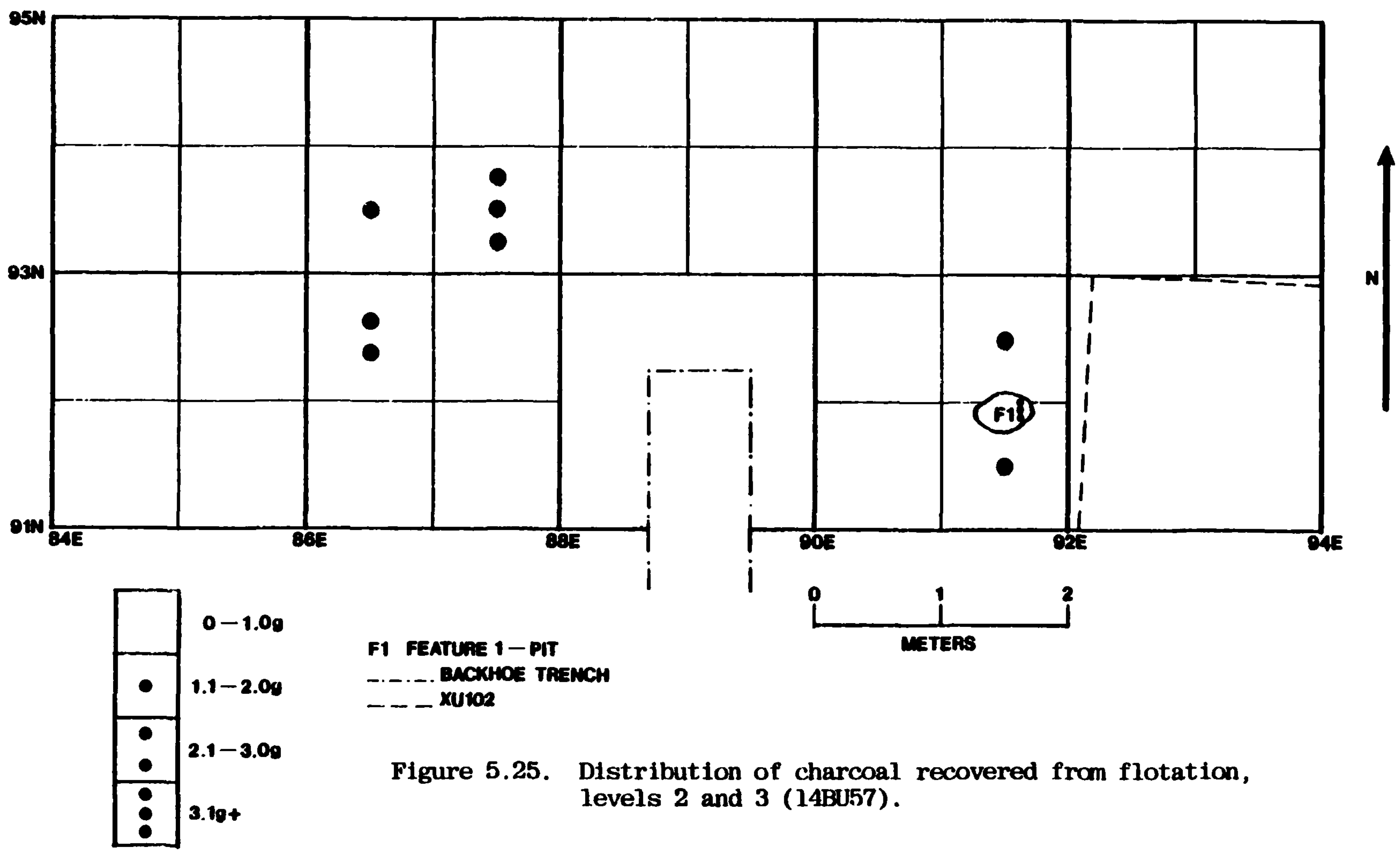

Figure 5.25. Distribution of charcoal recovered from flotation, levels 2 and 3 (14BU57).

zone lies within the top 40 cm. of the site. The intact, subplowzone portion is 20-25 cm. thick. The two complete projectile points and the point fragment suggest a Woodland occupation. This is further supported by the ceramics which are Woodland in style and have been assigned to the Verdigris ceramic type.

Verdigris pottery is the predominant pottery type associated with Greenwood phase sites (Reynolds 1979:94). This phase is dated between A.D. 380±230 and A.D. 1045±115. Site 14BU57 has a single, corrected radiocarbon date of A.D. 1191±30. This suggests a long survival of the Late Woodland period in the El Dorado area. The Plains Village Tradition is generally thought to begin at approximately A.D. 1000. The only Plains Village materials recovered from the site are five triangular unnotched and side-notched projectile points which were surface collected in 1977 (Leaf 1979). All data points to a single occupation transitional between Late Woodland and Plains Village. If this is the case, it may be indicative of a local development of Plains Village in the El Dorado Reservoir area rather than as the result of migration of outside peoples into the area.

Site 14BU57 shares limited similarities with site 14BU55, dated at A.D. 1000±25. Site 14BU55 is also transitional between Late Woodland and Plains Village. Verdigris type pottery was also recovered from this site, but it is tempered with crushed bone rather than limestone (Adair and Klon: 1981). <u>Zea mays</u> was recovered from both sites, although it was present in larger quantities at site 14BU55. At this point, since a structure was exposed at site 14BU55 but not at site 14BU57, insufficient data preclude further comparisions.

The second objective of the excavations, identifying evidence of structures and activity areas, met with limited success. Although no architectural remains were encountered, a small pit, the only feature, which may have been associated with a structure, was exposed in unit 10. The pit contained debitage (2.0 g.), charcoal (6.2 g.), burned earth (4.6 g.), limestone (1.0 g.), bone (0.5 g.), and charred Black Walnut meat (N=1). Its purpose is unknown but cultural material was concentrated in the surrounding area (Figs. 5.16 through 5.19 and 5.24 through 5.26). The high incidence of lithic chipping debris, including chert recovered in 1977 from XU102 (unit 11), suggests that this may have been a stone tool manufacturing area.

The block excavation revealed cultural materials were basically concentrated in two areas separated by a small concentration of pottery in unit 6. It is suggested that this pattern may have been the result of refuse disposal practices. This hypothesis is supported by some of the data. Of the lithic tools, 61% are broken. Burned limestone was not associated with hearths or roasting pits and it was very weathered, suggesting that the stones were no longer useful for their intended purposes possibly as hearth stones and boiling stones. Recovered deer bones were lower leg elements, some of which articulated, low in meat and marrow content. These elements would have been discarded when butchering the animal.

Recovered cultural material indicates that the inhabitants of the site were engaged in a variety of activities. Stone tool manufacturing and maintenance activities, as evidenced by the lithic debris, occurred at the site. The stone tools, butchered bones, and charred nut remains are suggestive of hunting, gathering, and food processing activities. The diet was composed, in part, of deer, fish, probably birds, acorns, walnuts, hickory nuts, and _Zea mays_. The single kernel of _Zea mays_, while not conclusive evidence for direct maize cultivation by the inhabitants of the site, does suggest that they had access to cultivated plants. The nuts and remains of an immature deer indicate that the site was occupied in late summer and early fall, if not year round.

Although there is potential for further data recovery at site 14BU57, it is felt that additional investigations are not warranted given the limited time and funding restrictions for the project as a whole. The data sample recovered from 14BU57 is significant in its suggestions for Late Woodland-Plains Village transition, and forms a comparative base for further study in the region.

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CHAPTER 6

SPATIAL PATTERNING AT THE TWO DEER SITE (14BU55): A PRELIMINARY REPORT

Mary J. Adair

Introduction

This chapter provides results of a preliminary analysis of the patterning of cultural materials within House 1 at the Two Deer site. Located on the south bank of Bemis Creek (Fig. 6.1), the site will be inundated at the floodpool stage of El Dorado Lake. Excavations of a component at this site, dating to A.D. 1000±25, produced ceramics, chipped stone tools, chipping debris, ground stone artifacts, and floral and faunal remains. Over 90% of this material was located within the boundaries of House 1, an oval to circular wattle and daub structure. Controlled data recovery techniques within $1m^2$ excavation units allow for the reconstruction of spatial patterning of these materials.

The quantity of cultural remains and the feasibility of a micro-level spatial analysis are not the only factors that serve to make Two Deer a significant site. After initial tests in 1975 (Fulmer 1977), the site was known to contain at least one structure, stationary grinding slabs in the center of the house, an array of chipped stone tools, debris, and ceramics dispersed around the metates, and evidence of an agricultural subsistence base. Additionally, styles of projectile points and ceramics, along with radiocarbon dates of A.D. 980 and A.D. 1060 (Fulmer 1977) combined to suggest an occupation transitional from Plains Woodland to Plains Village traditions. Since no other site in the project area was known to exhibit the same qualities, the Two Deer site was recommended for extensive excavation. To this end, two seasons, 1978 and 1979, focused on extensive data recovery at Two Deer (Adair and Brown 1981).

Prior to the 1978 season of excavation, three major research goals were delineated (Adair and Brown 1981). These served as the basis for the formulation of field and laboratory techniques while providing a focus for analyses. The three research oriented goals are summarized as follows. First, as a means of increasing our understanding of the prehistory of Kansas, the material culture remains at Two Deer must be analyzed in view of the indication that the occupation identifies the local continuity between Plains Woodland and Plains Village traditions. Although geographical variations exist in both Woodland and Village period sites throughout the Central Plains, basic artifact inventories and styles are common to each (Wedel 1959, 1961). The large artifact inventory from the Two Deer site allowed for a meaningful comparison to be made using ceramics and chipped stone tools. In addition, the presence of structures and evidence of agriculture made it possible to discuss and compare settlement-subsistence patterns in more specific terms.

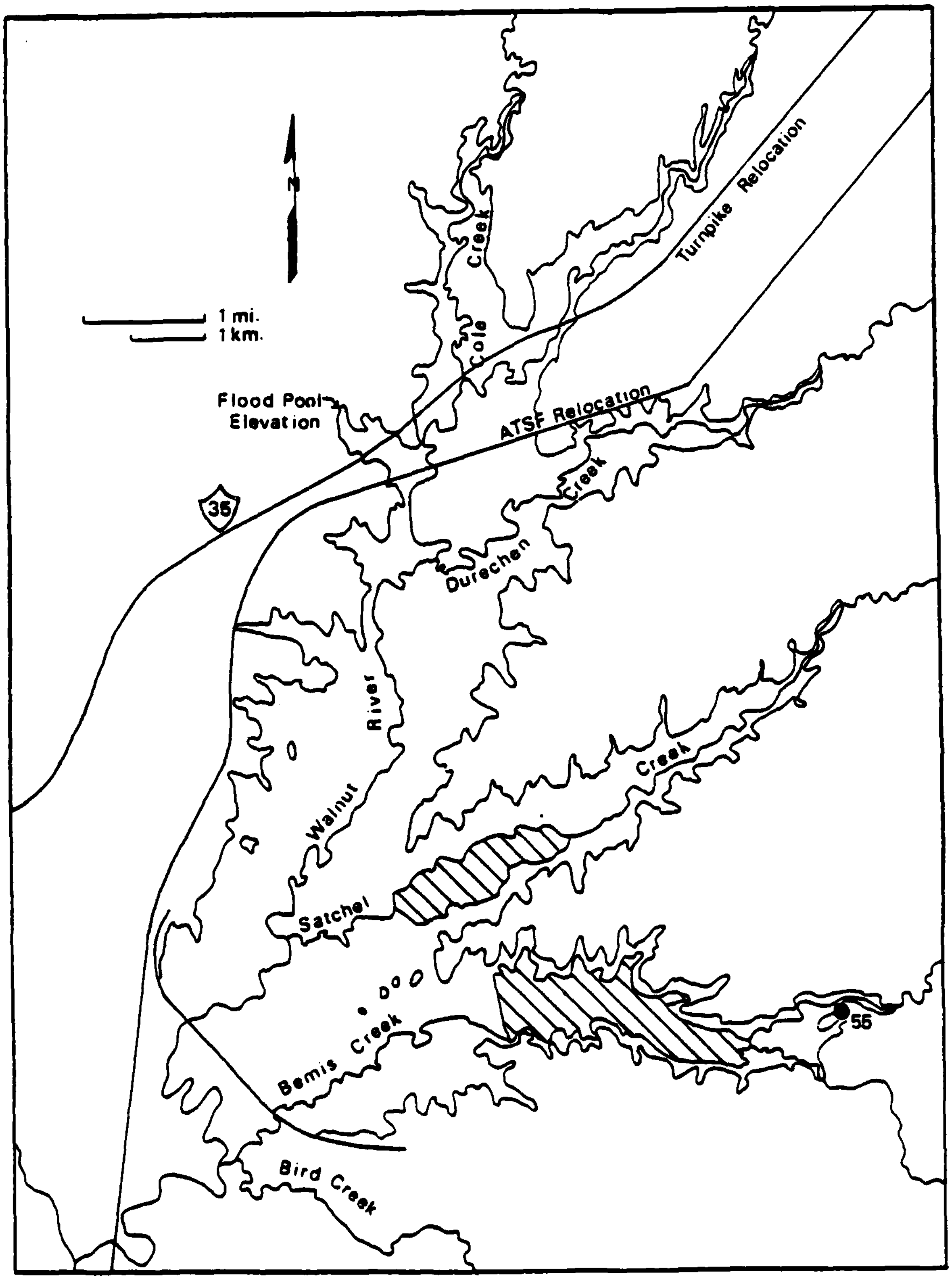

Figure 6.1. Location of the Two Deer site (14BU55) within the project boundaries.

This first research goal was the focus of a previous report on the site (Adair and Brown 1981). This earlier report addressed the validity of defining Two Deer as a transitory Plains Woodland-Plains Village site by analyzing the complete artifact inventory, the structures and associated features, the floral and faunal remains, and the chronology, and by further comparing these aspects to both Plains Woodland and Plains Village cultural phases in eastern Kansas and northeastern Oklahoma. Comparisons were made to the archeologically defined phases of Greenwood (Witty 1973), Grasshopper Falls (Reynolds 1979), Cuesta (Marshall 1972), Butler (Grosser 1970), and Bluff Creek (Witty 1978); to the Pomona focus (Witty 1967, 1978); and to the Middle Ceramic occupation at the Uncas site (Galm 1979). Artifacts from the Two Deer site, particularly the ceramics and evidence of agriculture combined to demonstrate that this site could not be grouped into any previously defined phase. However, when viewed from a pan-Plains perspective, several categories of artifacts, most notably the projectile points and ceramics, were characteristic of styles associated with both the Plains Woodland and the Plains Village traditions. These artifacts will be presented in following sections of this report.

The second research goal focused on subsistence. The presence of tropical cultigens (Zea mays and Cucurbita pepo) and native cultigens (Helianthus annuus and Iva annua) at Two Deer is the first evidence for prehistoric agriculture in the project area. While agriculture is believed to be more characteristic of Plains Village tradition sites than Plains Woodland, data from Two Deer suggest that a well-developed agricultural subsistence base existed by A.D. 1000. However, data from other sites throughout the Central Plains attest to the fact that hunting and gathering continued to be an important activity to many groups until historic times. Why some groups retained their adaptive hunting and gathering strategies while others adopted a subsistence based on corn, squash, beans, and sunflower is not clearly understood. To address this enigma, several points need to be delineated. Two are the documentation of the introduction of cultigens onto the Plains and the acceptance or adoption of these foods by the prehistoric inhabitants. When these events occurred in prehistory is an important step in understanding the beginnings of agriculture. While evidence from the Two Deer site may not fully address this issue, it can aid in determining when agriculture was adopted and how important it was in the subsistence base of prehistoric occupants of south-central Kansas. This particular focus of research will be addressed in a forthcoming dissertation.

The final area of investigation for the excavations at Two Deer was a focus on the spatial patterning of the artifactual material within the house structure. This type of analysis of spatial patterns is known as intra-site or micro-level spatial analysis (Clarke 1977) and the focus is on the reconstruction of cultural processes which are likely to produce the observed spatial patterning of the material culture. More commonly, the attention of spatial analysis has been on the level of settlement pattern studies or site catchment analysis. Both are stressed in the research design (Leaf 1976, 1979) as important aspects of the project. However, since Two Deer offered the potential for a micro-level spatial analysis due to the concentration of material culture within a house structure, this level of spatial analysis should not be ignored. As previously stated, this research goal is the focus of this chapter.

Background

The Two Deer site, located on the south bank of Bemis Creek within the floodpool boundaries of El Dorado Lake, was the focus of investigation by the Museum of Anthropology, University of Kansas, for three seasons. While surface debris contained artifacts diagnostic of Archaic, Plains Woodland, and Plains Village culture periods, subsurface investigations were restricted to Subarea A (Fig. 6.2), where materials from the latter two periods were located. Excavations within this area uncovered a single occupation dated to A.D. 1000±25. This date is based on an average of six radiocarbon samples (Adair and Brown 1981:Table 5.1).

Approximately $212m^2$ of this occupation was uncovered (Fig. 6.3), yielding a variety of chipped stone tools, a large quantity of ceramic fragments, ground stone tools (including two large metates), debitage, and unworked raw materials. Most of these artifacts were in direct association with two structures. Identified faunal remains indicate that prehistoric inhabitants utilized adjacent floodplain forest and upland prairie environments for the exploitation of deer, raccoon, beaver, and bison. Floral remains identified, such as goosefoot, pigweed, spurge, and black walnut, attest to gathering from nearby wooded and prairie areas. The presence of charred achenes of cultivated sunflower, marsh-elder, pumpkin, and corn indicate that agriculture was an equally important means of subsistence.

Artifacts

Ceramics from the Two Deer site are represented by over 2,000 fragments (Table 6.1). This total includes 68 rims, four base fragments, and 1,972 body vessel fragments. From this total, 408 sherds, or approximately 21% of the sample, were subjected to an intense analysis. This subsample was comprised of all the rim sherds, and a portion of the body sherds over three cm. in any direction. The analysis focused primarily on information concerning temper, color (slip, interior color, exterior color, and core), surface treatment (interior and exterior), finishing technique, presence of carbon streak, placement of cordmarking, cord width, cord twist, and body thickness. In addition, four variables were also recorded for the rim sherds. These are lip thickness, rim thickness, rim height, and when possible, orifice diameter.

The pottery is highly distinctive, as approximately 80% exhibits burned crushed bone temper. Other prominent characteristics are S-twisted cordmarked exterior surfaces, straight rims with slight shoulders, and long bodies with conoidal bases. Variations include sherd (10%), limestone (.4%), and grit (.2%) temper; smoothed, slipped, or incised exterior surfaces (4%); slightly flaring rims with prominent shoulders; shorter bodies with an overall globular shape (11%); and small bowls (5%) (Adair and Brown 1981:267-71).

A petrographic analysis indicates that the pottery is made from an alluvial clay. Coil-bond breaks on several sherds indicate that the mode of manufacture was coiling. In most cases, the finishing technique

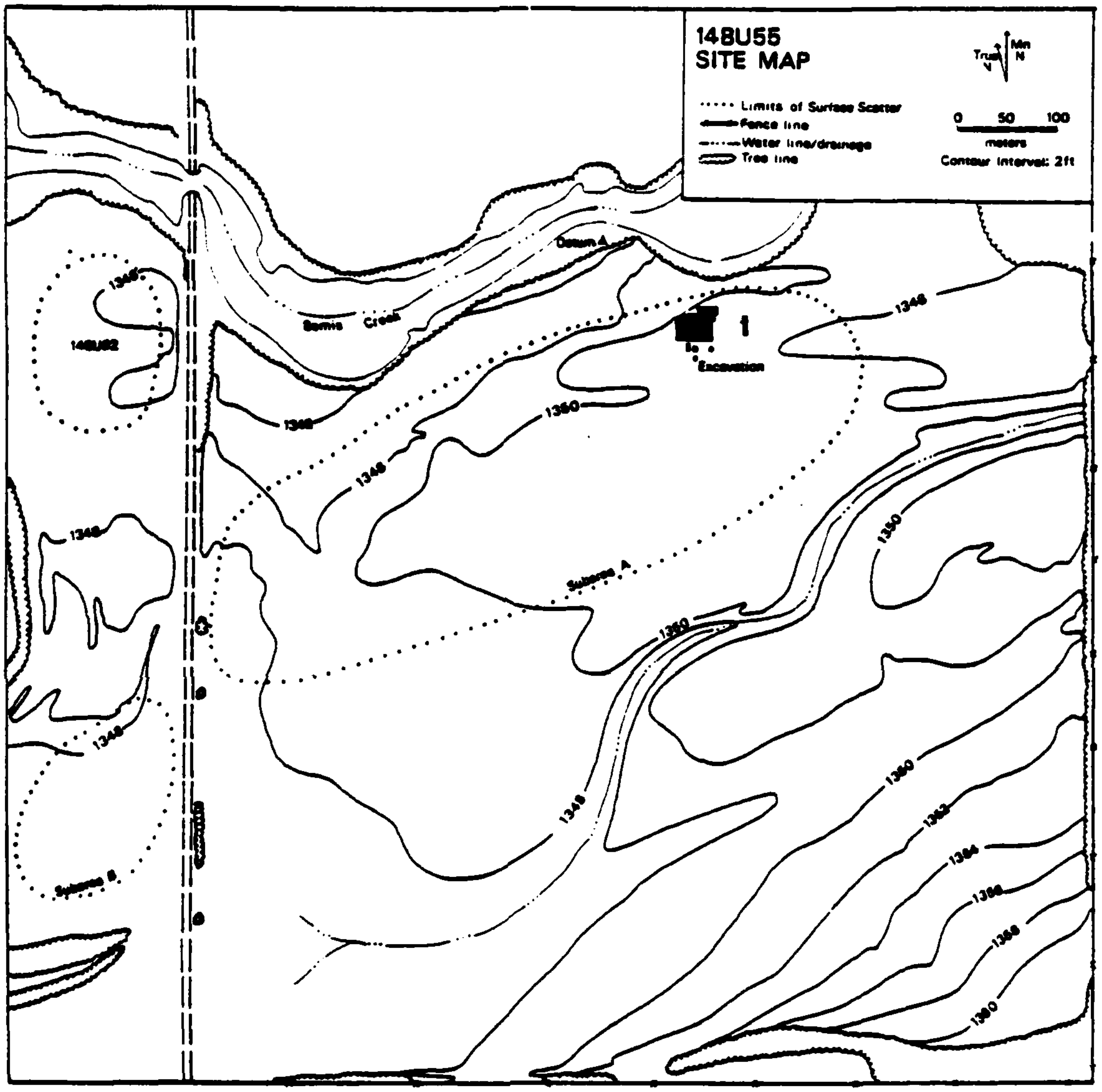

Figure 6.2. Site map (14BU55), showing location of surface scatter and subareas.

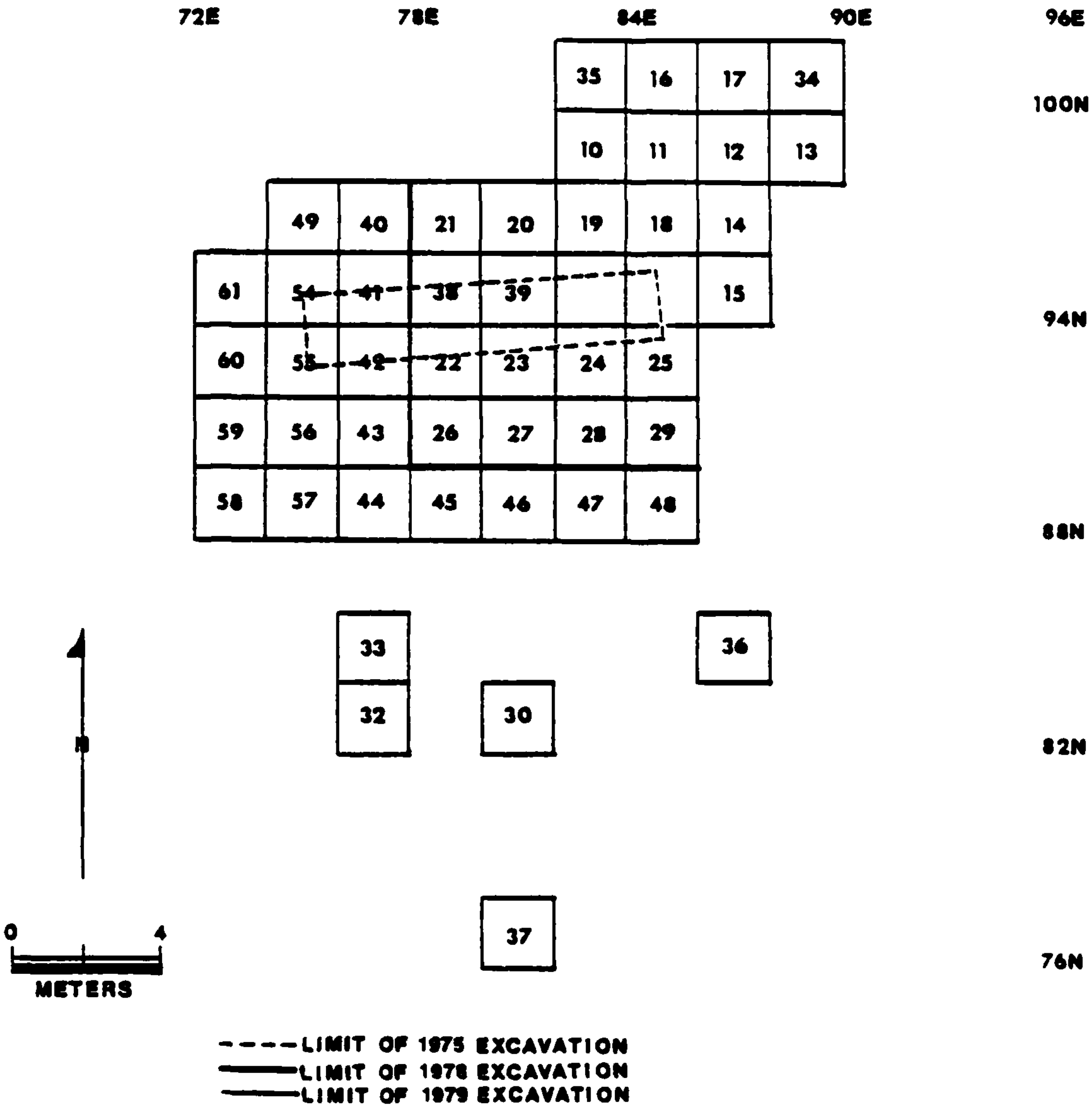

Figure 6.3. Excavation units, 14BU55.

Table 6.1. Artifact assemblage, 14BU55.

Category	Year of Excavation 1975	1978	1979	Total
Hafted biface	1	17	18	36
Non-hafted biface	3	68	61	132
Side-scraper		12	4	16
Disto-lateral scraper		2	7	9
End scraper		1	2	3
Denticulate		5	4	9
Notch		9	12	21
Perforator/graver		5	4	9
Chopper		2	5	7
Core		17	12	29
Tested cobble		2	3	5
Hammerstone		1	4	5
Retouched flake	1	76	201	278
Retouched chip		78	106	184
Retouched potlid		1	5	6
Retouched shatter		9	34	43
Utilized flake		95	98	193
Utilized chip		105	26	176
Utilized shatter		10	7	17
Chip		2936	3974	6910
Flake		994	1065	2059
Chunk and shatter		2679	2559	5238
Potlid	548*	39	104	143
Worked stone		2	6	8
Unworked limestone		700(5.2kg)	604(2.5kg)	1304(7.7kg)
Unworked sandstone		42(1.6kg)	25(.85kg)	257(2.5kg)
Mineral		4(6.4gm)	2(5.2gm)	6(11.6gm)
Cobbles		11(1.1kg)	6(.5kg)	17(1.6kg)
Weathered chert		50(63gm)		50(63gm)
Rim fragments-ceramics	2	46	20	68
Base fragments-ceramics		2	2	4
Body vessel fragments	30	872	1070	1972

* total amount of debitage

was paddle and anvil, as confirmed by the presence of exterior cordmarking and anvil indentations on sherd interiors. Rims are straight to slightly outcurving with flat to slightly rounded lips (Fig. 6.4).

Although a few sherds in the assemblage exhibit variability in color, most fall within the YR-range of the Munsell Soil Color Series (variations of red-yellow hues). Colors within the 10YR are common, with shades of buff, brown, and gray most numerous. Exterior vessel color ranges from very dark gray (10YR 3/1) to pale brown (10YR 6/3), with the interior tending towards darker colors. Vessels exhibiting colors in the 5YR hue (reddish-brown) are present but are not predominant.

Cores of a majority of the body sherds have a carbon streak, indicating incomplete oxidation of organic matter present in the clay during firing. In these cases, the cores are dark, with colors ranging from gray to dark gray (10YR 3/1 to 10YR 6/2). Approximately 60% of the rim sherds are fully oxidized, as evidenced by lighter core colors. This suggests the vessels were placed upside down during the firing process, positioning the rims in closer contact with the fire and giving them a better chance of full oxidation.

Vessels range from large and conical with orifice diameters of 17 to 26 cm., to small globular pots with orifice diameters of 10 to 17 cm., to very small bowls with openings of only 4 to 6 cm. The large conical vessels exhibiting cordmarked exterior surfaces are styles representative of Plains Woodland sites while the globular vessels and the smoothed and incised exterior surfaces are styles more commonly associated with Plains Village.

Lithics from the Two Deer site include chipped stone tools and cores, lithic manufacturing debris, ground stone tools, hearthstones, minerals, and unworked stone (Table 6.1). Chipped stone projectile points are small and corner-notched (type 1), side-notched (type 2), or unnotched (type 3) forms (Fig. 6.5). A small percentage (9%) of large points also occurs. Approximately 23% of the small arrow points retain characteristics of the flake blank from which they were manufactured, suggesting expedient manufacture. Only a small number of points (two specimens) show signs of being reworked following breakage.

Non-hafted bifaces comprise the largest class (90%) of chipped stone tools, consisting primarily of small (mean measurements: 33.6 mm. in length, 18.9 mm. in width, 4.6 mm. in thickness), thin bifacial knives with well rounded or worn distal tips and considerable edge smoothing at the proximal end (Fig. 6.6). Variations include bifacial preforms, single-edged beveled knives, and celts exhibiting heavy utilization in the form of step fractures and lateral edge crushing.

Scrapers include side, end, and disto-lateral forms. Notches and denticulates are present in the assemblage along with choppers, perforators, and retouched flakes and chips. Along with an accumulation of lithic manufacturing debris, the presence of numerous cores and hammerstones indicates on-site tool manufacture.

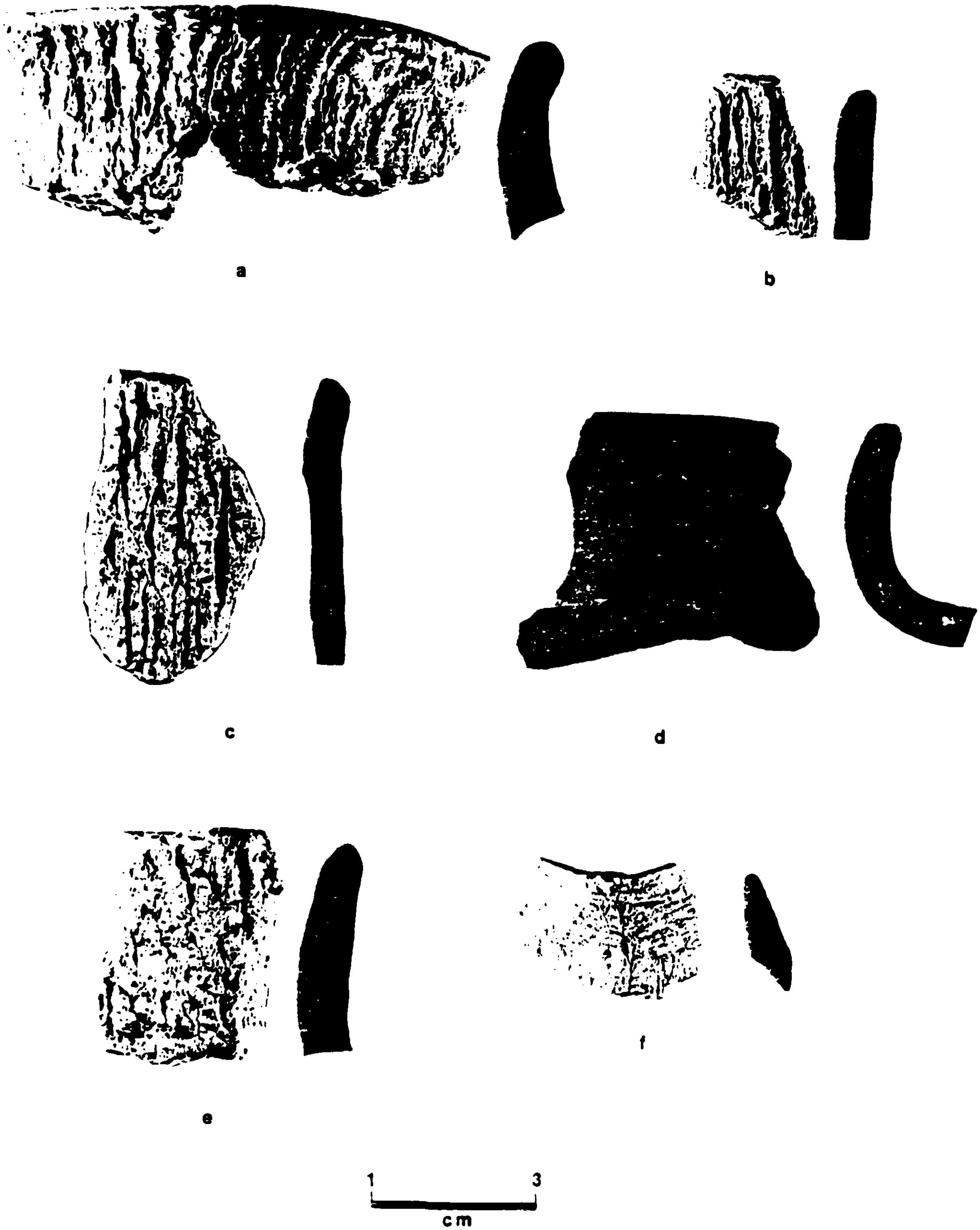

Figure 6.4. Rim fragments, 14BU55; (a) A55270130022/A55290320002, (b) A55380220014, (c) A55220210007, (d) A55590310004, (e) A55280140012, (f) A55380230003 (from Adair and Brown 1981:Fig. 5.13).

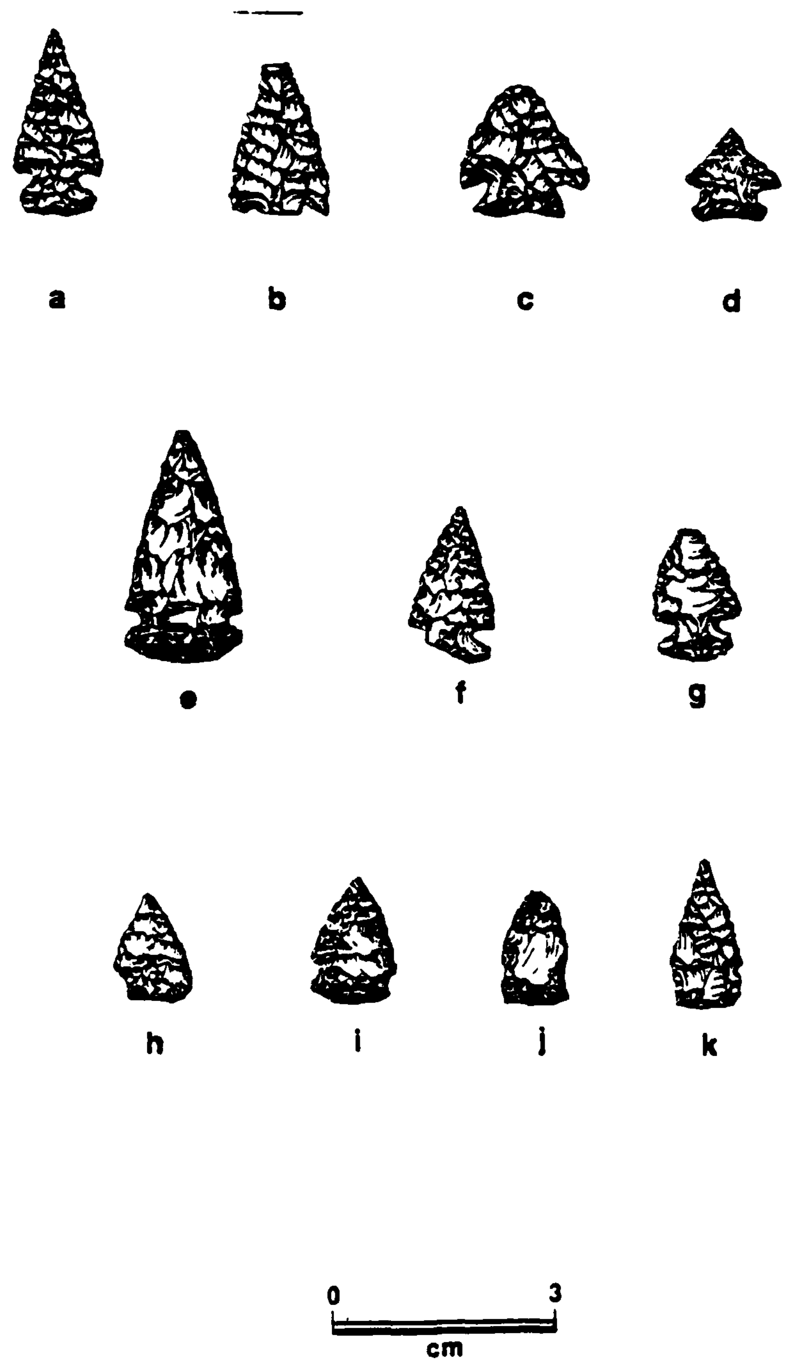

Figure 6.5. Hafted bifaces, 14BU55; type 1, (a) A55380220013, (b) A55380220016, (c) A55270140007, (d) A55560310008: type 3, (e) A55470240002, (f) A55430340009, (g) A55550120003, (h) A55220130006· type 2, (i) A55440220005, (j) A55470330002, (k) A55270120025.

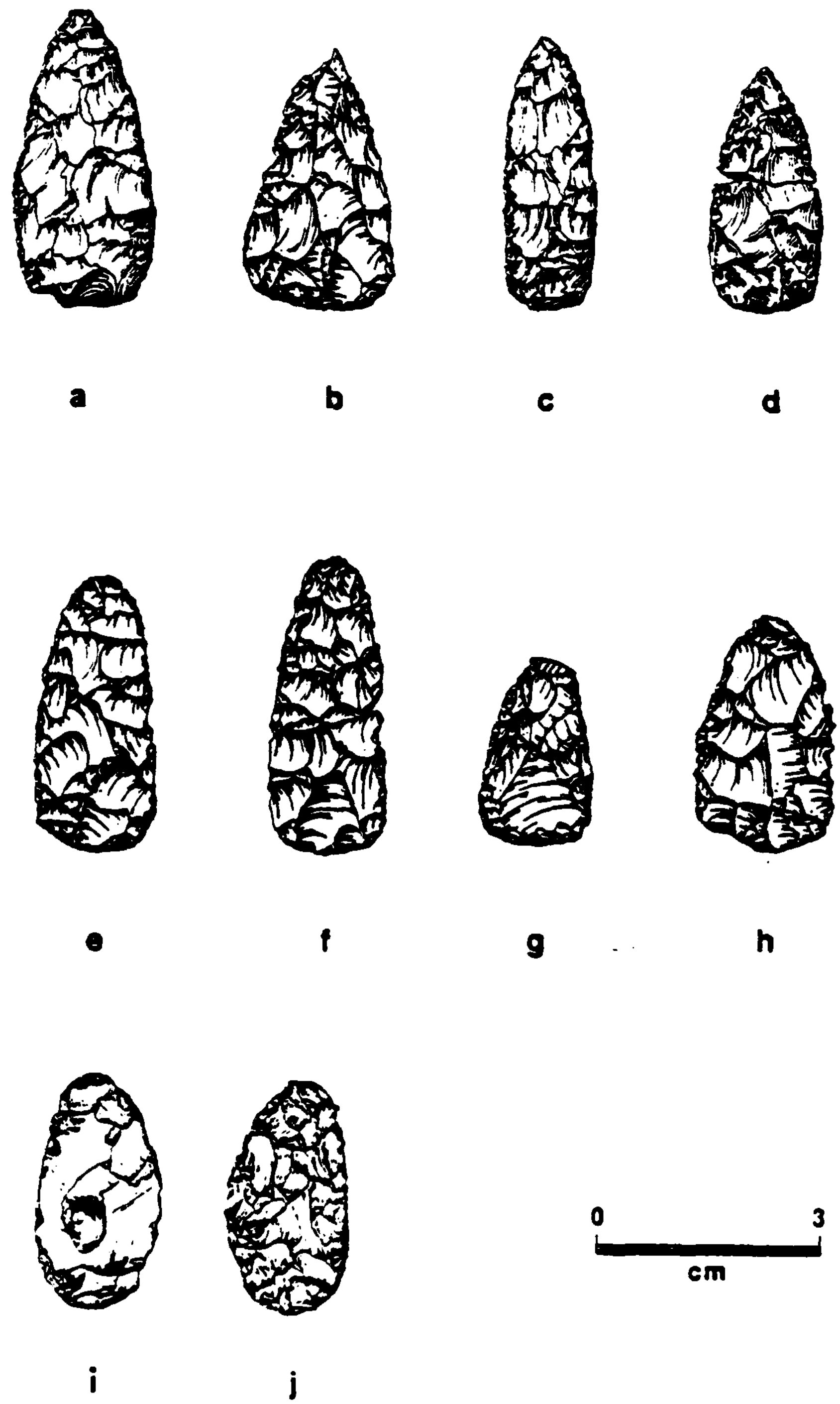

Figure 6.6. Non-hafted bifaces, 14BU55: (a) A55490320013, (b) A55270240004, (c) A55490220001, (d) A55270210002/A55270110027, (e) A55390210002, (f) A55390220033/A55200140001, (g) A55250110004, (h) A55200330001, (i) A55390220035 ventral face, (j) dorsal face (from Adair and Brown 1981:Fig. 5.18).

Local varieties of chert were almost exclusively selected for, and Florence A (Haury 1981) predominates. Thermal alteration was commonly applied to small cores and bifacial tools.

Ground stone artifacts are represented by metates, grooved sandstone abraders, and small nutting stones. A limestone bead indicates the manufacture of jewelry or ceremonial artifacts.

Based on the morphological characteristics of the defined artifacts, a variety of functions may be inferred. The use of the small corner-notched, side-notched, and unnotched arrow points in hunting activities is suggested from the presence of impact fractures on the tips of several specimens. A smaller number of hafted bifaces are larger forms more commonly associated with dart throwers and atlatls. Light to heavy cutting or butchering tasks are indicated by various forms of bifacial tools. Most of these tools are relatively thin artifacts that possess parallel lateral edges with edge angles of about 33%. Other bifacial tools are larger and suggest activities associated with digging or hoeing. Wood working and chopping tasks are presumed by the presence of heavily utilized scrapers and choppers, while end scrapers and disto-lateral scrapers possibly functioned in hide preparation and scraping activities. Perforating and graving activities are assumed by the presence of nine small tools that exhibit a drill-like protruding tip. Notched and denticulated flakes may have been designed for use with wooden objects while the numerous retouched and utilized flake tools served in cutting or scraping functions.

Worked stone present in the assemblage consists of grooved sandstone fragments which may have functioned as abraders in the manufacture of bifacial tools or wooden projectile shafts. Plant food processing is directly evidenced by four additional worked stone implements, including two metates, one sandstone and one weathered chert fragment.

The styles of tools present at Two Deer offer support for recognizing the site as a transitional Plains Woodland-Plains Village occupation. The only morphological category that may be addressed in this issue is the bifaces.

Small, corner-notched points, traditionally associated with the Plains Woodland period, are, however, also found in Late Archaic and post-Woodland sites. While usually thought to represent the introduction of the bow and arrow, these point forms are not a sound indicator of a chronological period. Small, side-notched, and particularly unnotched bifacial forms are, however, more commonly associated with post-Woodland occupations (Wedel 1959). While these are not numerous within the collection at Two Deer, their presence signifies at least the beginning of a shift from exclusively corner-notched forms. The only other archeological site investigated within the project area that yielded similar projectile forms is 14BU71; a date of A.D. 1210 is associated with this occupation (Fulmer 1977:56).

Alternately beveled and diamond shaped beveled knives are also artifact styles assigned to the Middle Ceramic (post A.D. 1000) cultural period (Wedel 1959, 1961). This type of bifacial tool was also recovered

from 14BU71 (Fulmer 1977:47-9). At the Two Deer site, two bifacial tools exhibited a single beveled edge on one face. One tool was complete, the other a distal fragment; it is, therefore, unknown whether this latter tool was diamond shaped. Again, the low frequency of this tool type in the collection of non-hafted bifaces from 14BU55 represents the initial change in tool types from primarily Plains Woodland forms to those associated with the Plains Village culture period.

Structures

Two structures recognized during excavations were labeled House 1 and House 2 (Fig. 6.7). Based on radiocarbon dates, these houses are approximately contemporary. In addition, only one occupation is evident from the vertical and horizontal arrangement of cultural material.

House 1, which was labeled by Fulmer (1977) in 1975, was identified by the presence of a daub and charcoal concentration, associated metates, large quantities of tools, pottery fragments and debitage, and several isolated post mold stains. The overall shape is oval to rectangular with rounded corners, and measures approximately 12 meters in diameter. Interior hearths and pits, while present (Fig. 6.8) are very poorly defined.

House 2 is represented by a series of 13 post mold stains that outline a portion of a rectangular structure with rounded corners. The structure is aligned northeast to southwest. Excavations disclosed only a corner of this structure since its location on the edge of a terrace of Bemis Creek has resulted in its almost complete destruction.

Both structures appear to have been constructed in a similar wattle and daub fashion. Approximately 4.8kg of fired clay daub was retained from House 1. Most of the yellowish-red daub fragments exhibit a rough inner surface which was pressed against the structure, and a smooth, grass-impressed outer surface. The grass impressions on one surface only suggest that a layer of mud was first applied to the frame of the structure, with the grass then being placed on the exterior surface. A few fragments of daub show grass impressions on both surfaces, indicating that the structure was either patched in certain spots or that more than one layer of mud and grass was applied during construction. One large fragment of daub displays parallel post (2-3 cm. in diameter) impressions, a further indication of the wattle and daub technique of manufacture. This mode of construction is similar to that described for Pomona structures at Dead Hickory Tree (Schmits, Reid and O'Malley 1980). The structures at Two Deer, however, appear to be much larger than those from Pomona sites.

Unlike structures in northeast Oklahoma (Galm 1979) and Upper Republican complex sites in northeast Kansas (Wedel 1959), houses at the Two Deer site are not semi-subterranean. There was no indication of change in soil texture or color during excavation between the exterior and interior of the structure. In addition, the post mold stains were encountered at the same level as the two metates. The metates are assumed

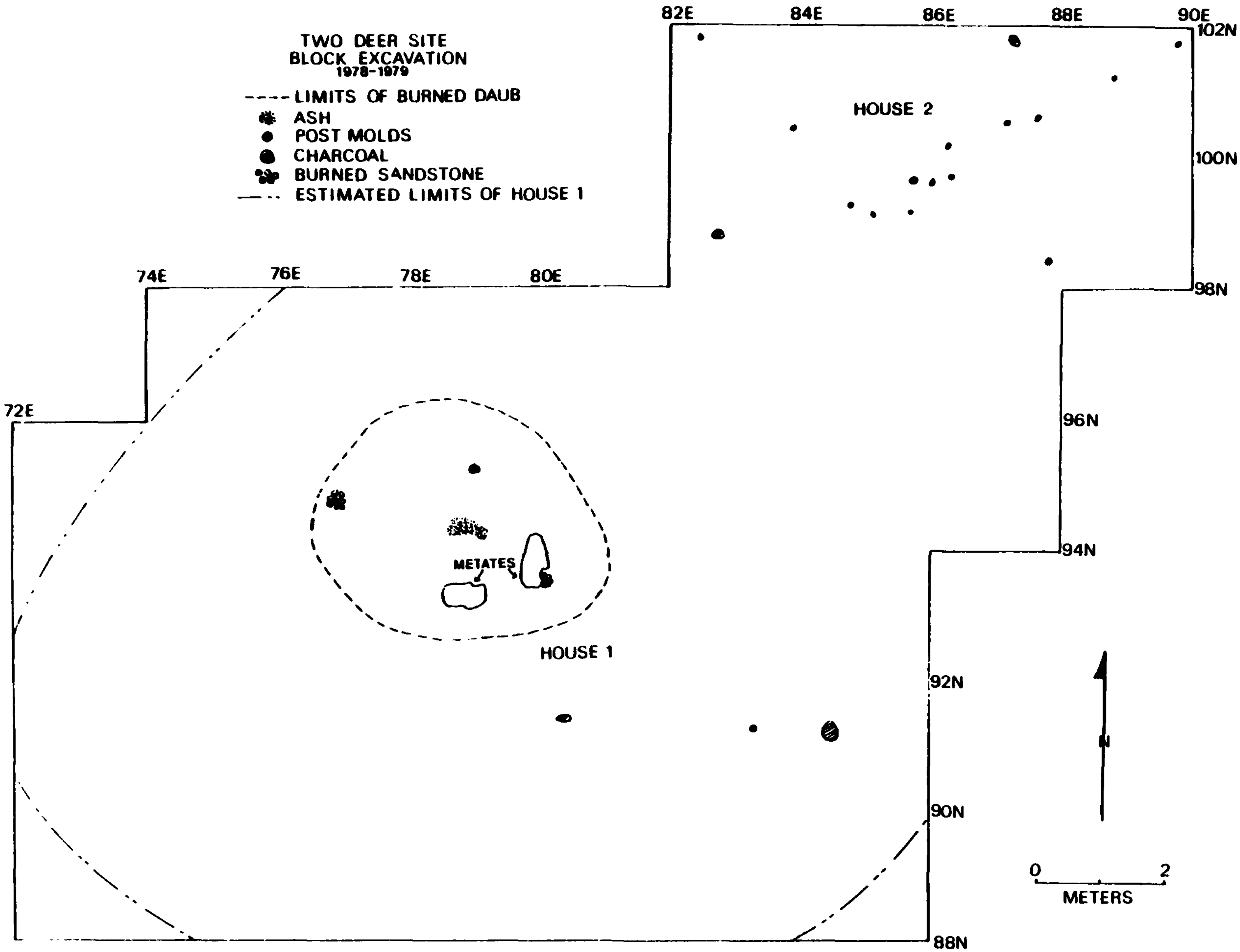

Figure 6.7. Block excavation showing house limits, post mold stains and associated features.

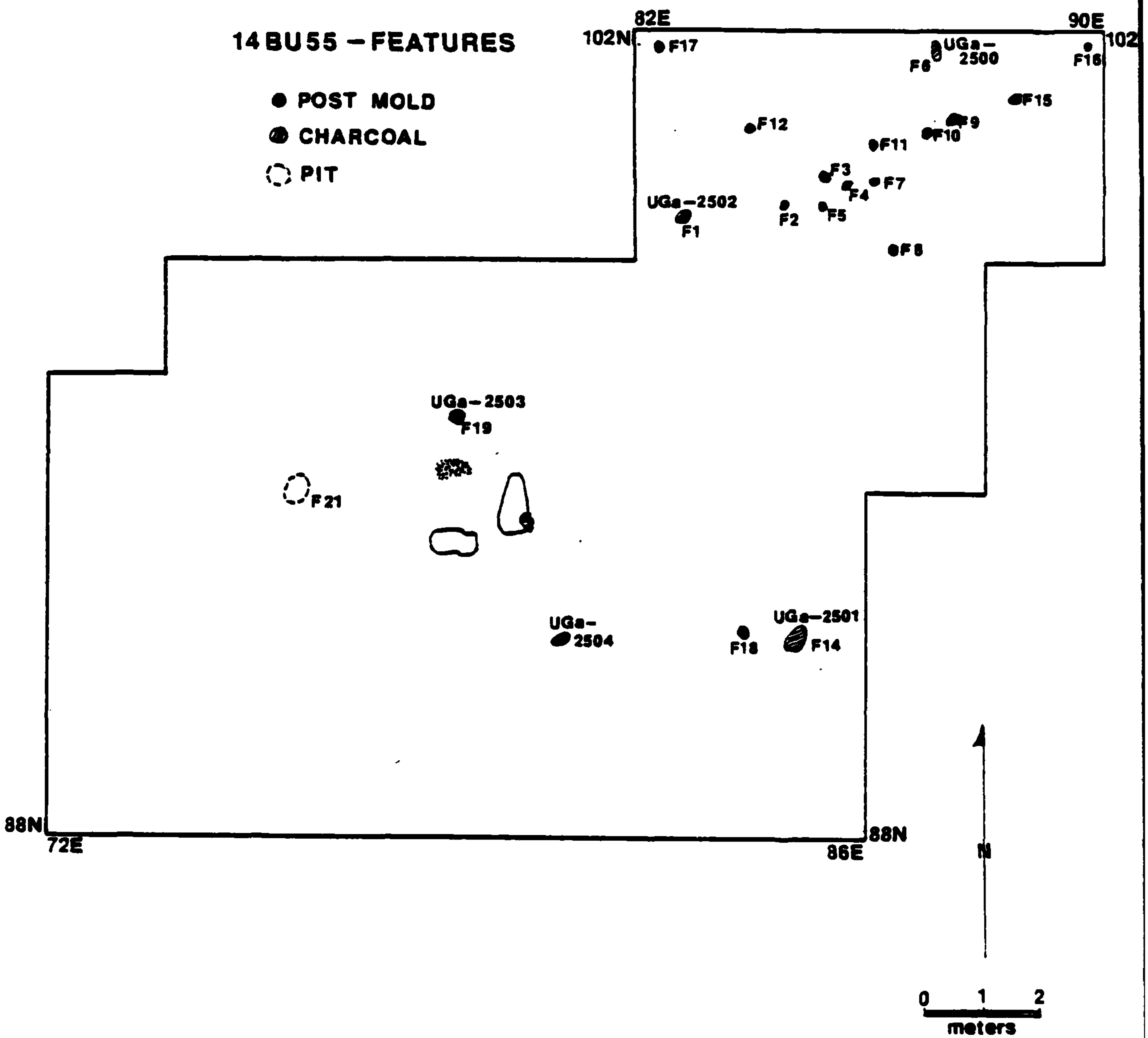

Figure 6.8. Plan view of features, 14BU55.

to have been lying on the house floor since no cultural material was recovered directly below them.

The area labeled House 1 is enclosed within the major block excavation. The estimated boundaries of this structure were determined primarily by the distribution of material culture remains due to the lack of delimiting post mold stains. The planar distribution of pottery, non-hafted bifaces, and retouched chips and flakes is presented in Figure 6.9. This map displays some interesting points. First, it illustrates the concentration of artifacts around the two metates and small fire hearth, an area presumably the center of the structure. Second, it demarks the relatively abrupt termination of artifacts in the northwest corners (E72, N98 and E72, N96), the southwest corner (E72, N88), and the southeast corner (E86, N88). The estimated limits of the structure were marked according to these areas of low artifact density. Third, the distribution does not clearly define the northeast corner of the structure, nor does it clearly separate the boundaries of House 1 from the post mold pattern of House 2. There are several possible explanations for this: 1) the northeast corner does not contain a quantity of artifacts as this area marks the entry-way into the structure. While a post mold pattern is lacking in support of this suggestion, a low density of cultural material has been associated with entry-ways at the Uncas site, a Washita River phase site in northeastern Oklahoma (Galm 1979) and at the Budenbender site, an Upper Republican occupation in northern Kansas (Johnson 1973). 2) The lack of a clearly defined separation between House 1 and the post mold pattern of House 2 may be an indication that only one structure is present within the block excavation. The existence of House 1 cannot be disputed, while House 2 is labeled a structure primarily by the presence of post molds. That these stains clearly define a second structure, rather than a feature such as a drying rack, is admittedly somewhat questionable. Another possibility for these stains may be that they represent a part of an extended entry-way for House 1. However, evidence is lacking to suggest that House 1 is that large. Large rectangular houses with extended entry-ways are not known farther south than the Smoky Hill complex of east-central Kansas and are generally associated with post-Woodland complexes. Until more data are available, the northeast corner of House 1 is suggested to be the location of the entrance to the structure and the postmolds to the northeast remain defined as separate from House 1.

In addition to the planar distribution map of artifacts, four vertical distribution maps were prepared to present a cross-section of pottery and chipped stone tools along an east-west and a north-south axis through House 1. Figures 6.10 and 6.11 show the vertical arrangement of chipped stone tools and pottery, respectively, from a 1x14 m. area (from E72, N94 to E86, N94) collapsed along the north wall. Figures 6.12 and 6.13 show the same artifact material from a 1x10 m. area (from E78, N88 to E78, N98) collapsed along the east wall. In Figure 6.10, the chipped stone tools become more concentrated and are at a lower elevation towards the center of the map, while the sides, especially the right side, clearly show a dispersal of the material at a higher elevation. The same distribution is noted for the pottery in Figure 6.11. Here, the heavy concentration in the center represents a broken vessel whose pieces remained in the same area. However, both maps indicate a lower elevation for material that is

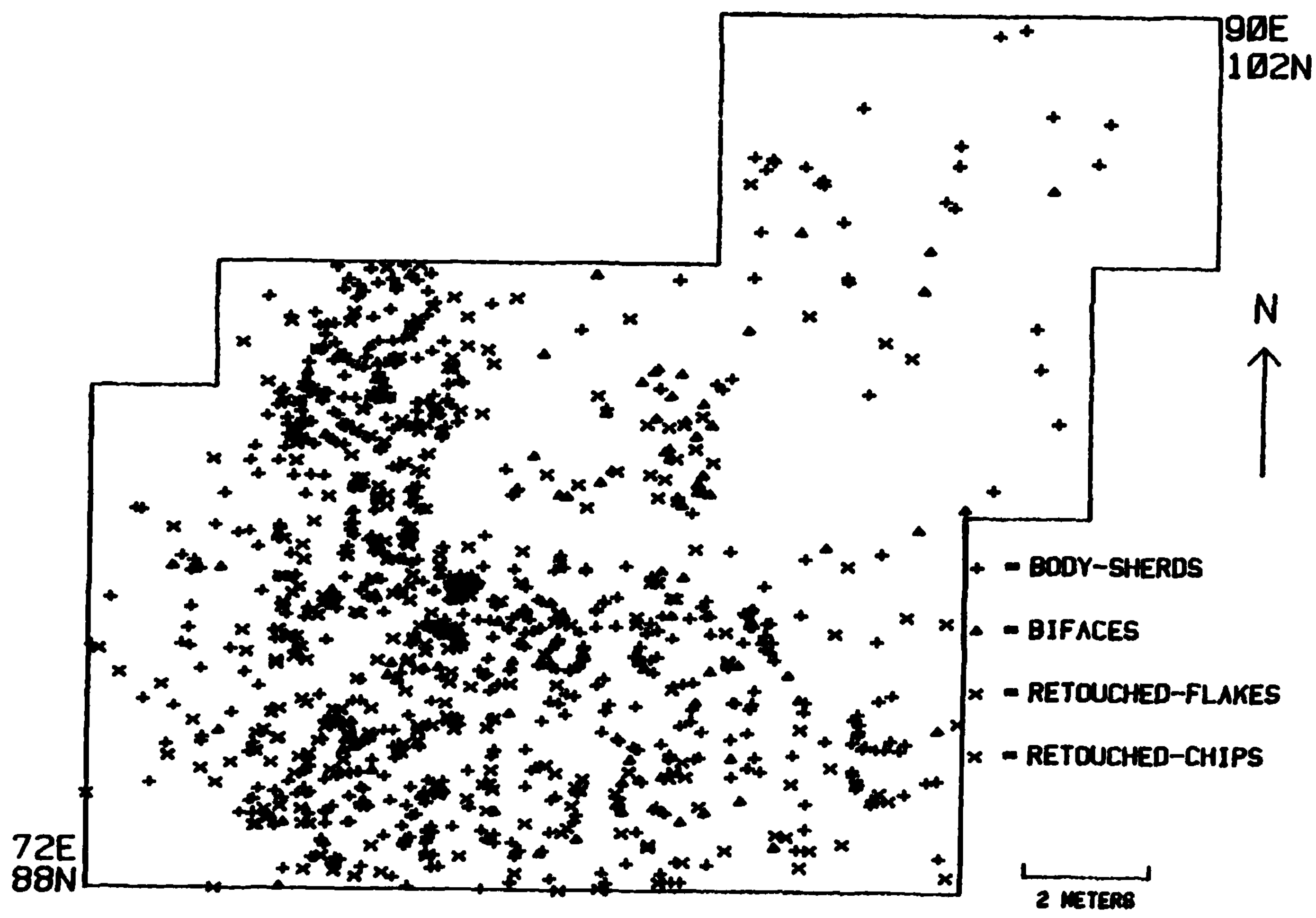

Figure 6.9. Planar distribution of artifacts within the block excavation, 14BU55.

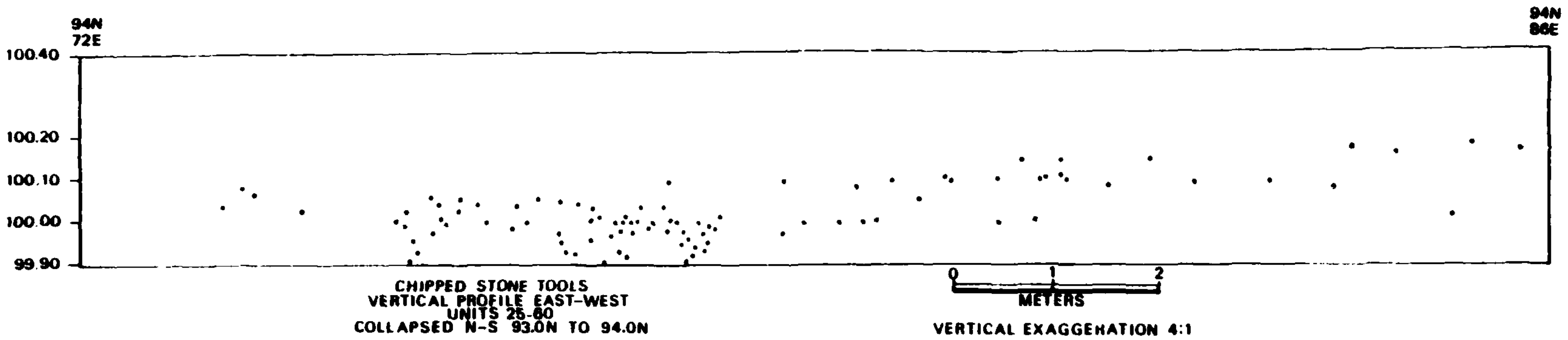

Figure 6.10. Vertical distribution of chipped stone tools, E72-E86, one meter collapsed.

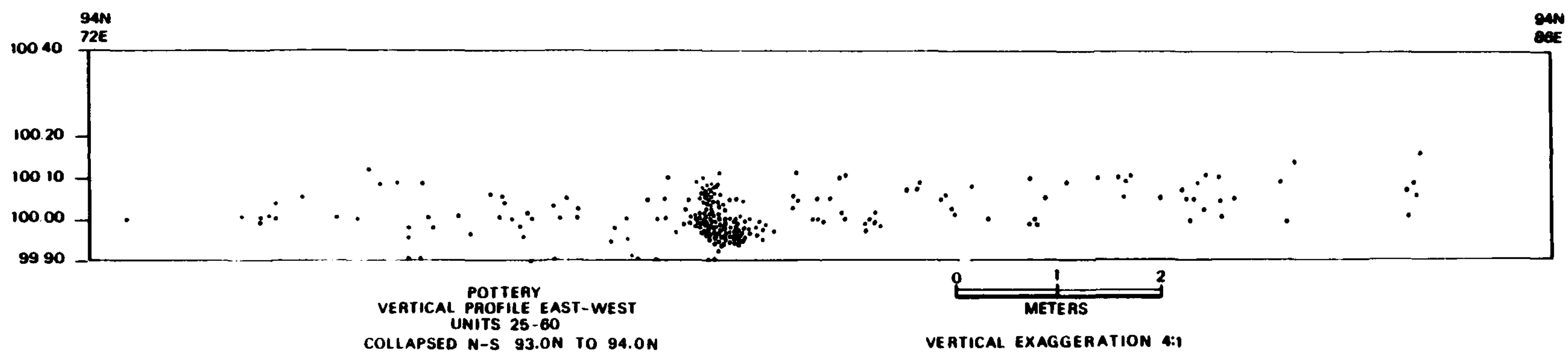

Figure 6.11. Vertical distribution of pottery, E72-E86, one meter collapsed.

more concentrated and a general slope in the material towards the center of the map, which corresponds to the center of the structure. As a point of reference, the two metates were located at about the center of these maps at an elevation reading of 100.00.

Figure 6.12 illustrates the distribution of chipped stone tools along a north-south axis at right angles to the east-west axis of Figures 6.10 and 6.11. This distribution suggests a slope in the cultural material towards the right side, or north, while the density remains relatively constant. Figure 6.13 generally supports this suggestion although a concentration of pottery is evident at the left, or south end, at a higher elevation point. Again, the center of this map displays the broken ceramic vessel seen in Fig. 6.11.

These four vertical distribution maps suggest two interesting points. First, there is a tendency for the cultural material to slope towards the center of the structure. This is true for both pottery fragments and chipped stone tools. And second, cultural material is more densely concentrated in the lowest areas of the slope. However, the depth of the metates and post mold stains clearly indicate the approximate location of the prehistoric living floor to be above some of the cultural material. It is suggested here, and will be discussed in following sections of this chapter, that the density and compactness of the cultural material in the center of the structure has, in part, caused the material to slope. Wedel (1959:559) warns of the tendency to label such a slope in cultural material as evidence for a semisubterranean or pithouse structure. He suggests instead that repeated usage of a central area in a house by the prehistoric inhabitants may have actually forced the cultural material into and below the living floor, thus giving the appearance of a sloping floor or semisubterranean structure. This is a most conceivable suggestion, and appears to have been the case at the Two Deer site.

Three additional maps prepared for spatial patterning analysis are also applicable to this section. Fig. 6.14 represents the distribution of daub; Fig. 6.15, the location of limestone; and Fig. 6.16, the distribution of sandstone. All maps represent amounts by weight with the density intervals determined by the mean and standard deviation. As there is only one occupation represented at Two Deer, the arbitrary 10 cm. excavation levels were collapsed for these distribution maps.

The daub distribution shows the heaviest concentration at approximately the center of the structure (Fig. 6.14). This corresponds to the distribution noted in Fig. 6.7. A heavy daub concentration associated with the interior of a structure has also been noted as occurring at Pomona sites (Wilmeth 1970; Rohn, Stein and Glover 1977; Schmits, Reid and O'Malley 1980). This may suggest a similar mode of manufacture between Pomona houses and that at Two Deer, or at least, a similar manner of destruction such that the daub remains primarily in the center of the structure.

The limestone distribution is quite opposite that of the burned daub. Figure 6.15 shows the heaviest amounts of both burned and unburned limestone pieces to be either along the edges of House 1 or outside the house altogether. It should be noted first, however, that interval seven,

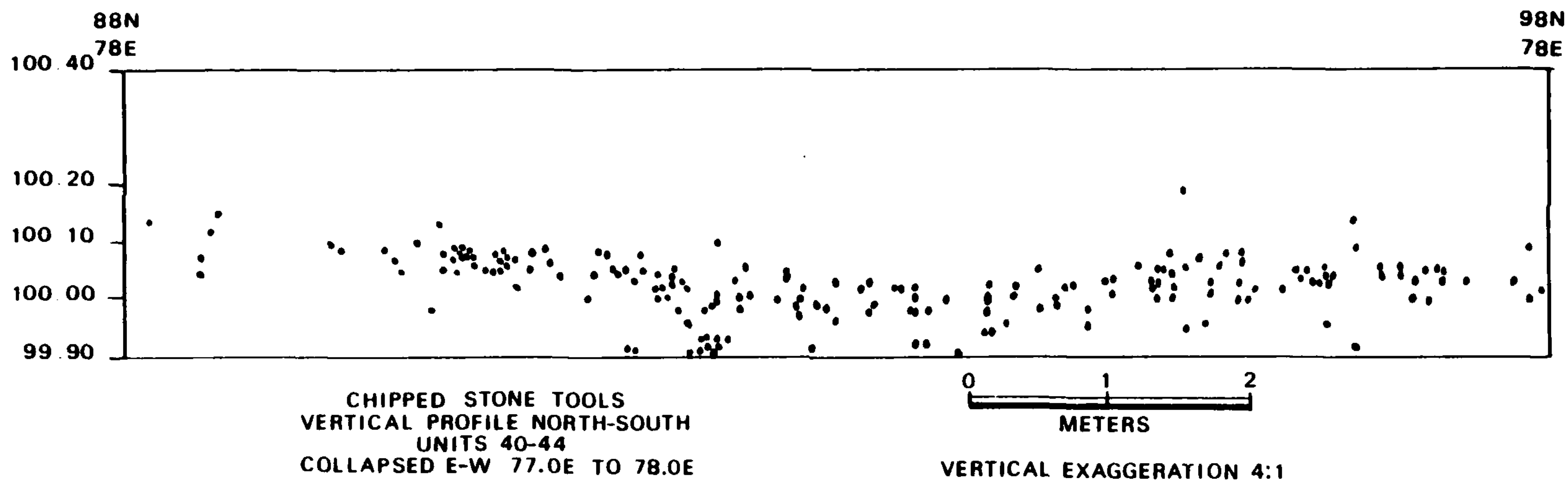

Figure 6.12. Vertical distribution of chipped stone tools, N88-N98, one meter collapsed.

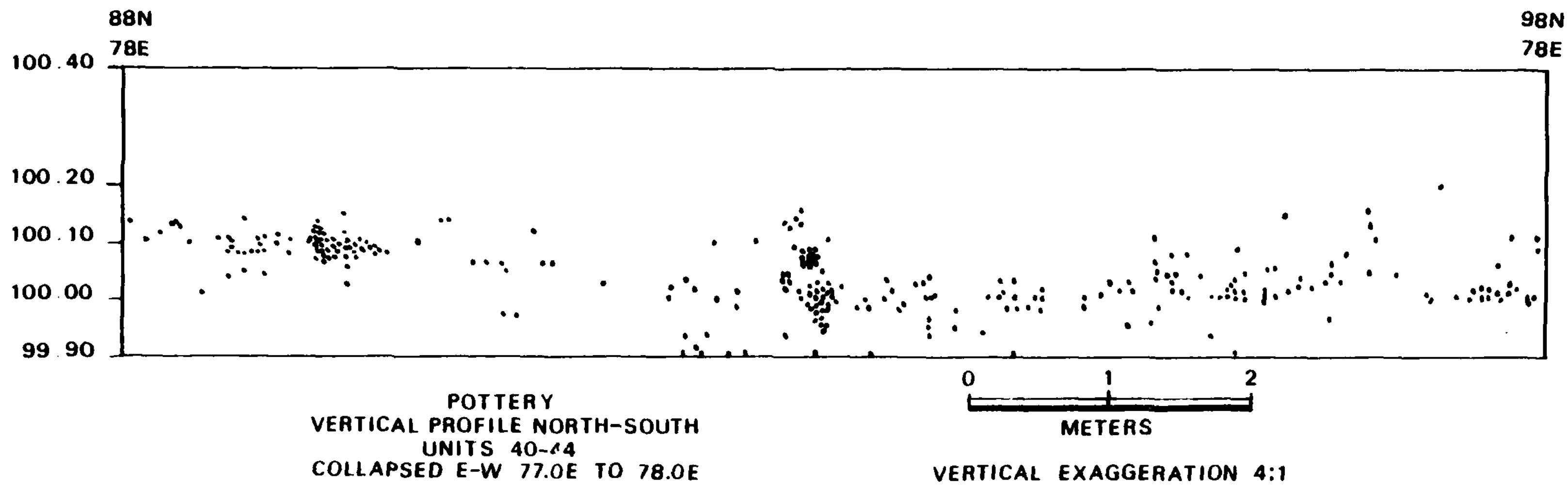

Figure 6.13. Vertical distribution of pottery, N88-N98, one meter collapsed.

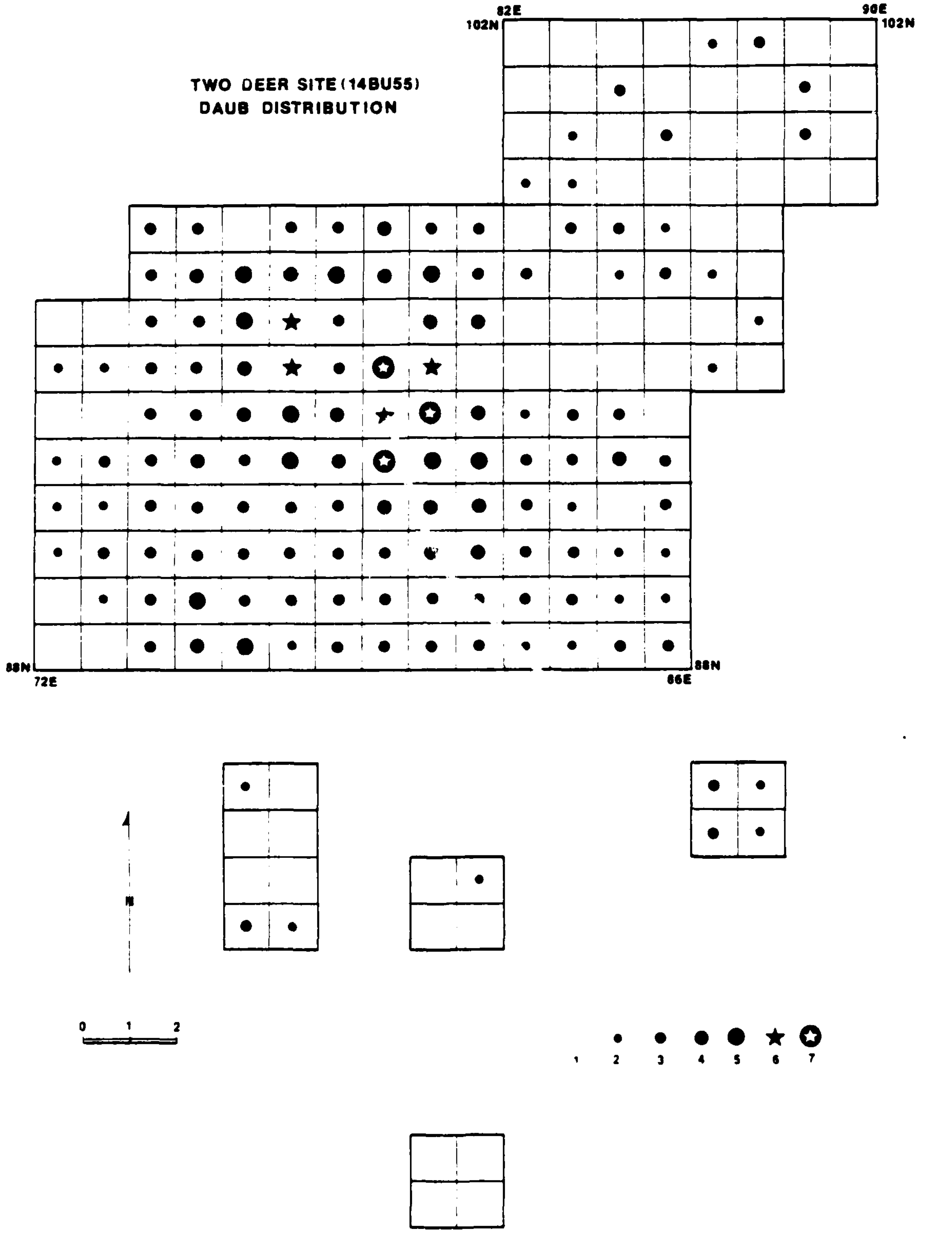

Figure 6.14. Daub distribution, 14BU55. Legend: 1=empty units: 2=.1-3.0gr (>0), or very low density: 3=3.1-25.9gr (>.5 s.d.) or low density: 4=26.2-66.2gr (>$\overline{X}$) or medium density: 5=73.7-110.6 (>1 s.d.) or medium high density: 6=128.7-157.0gr (>2 s.d.) or high density: 7=216.0-591.6gr (>3 s.d.) or very high density.

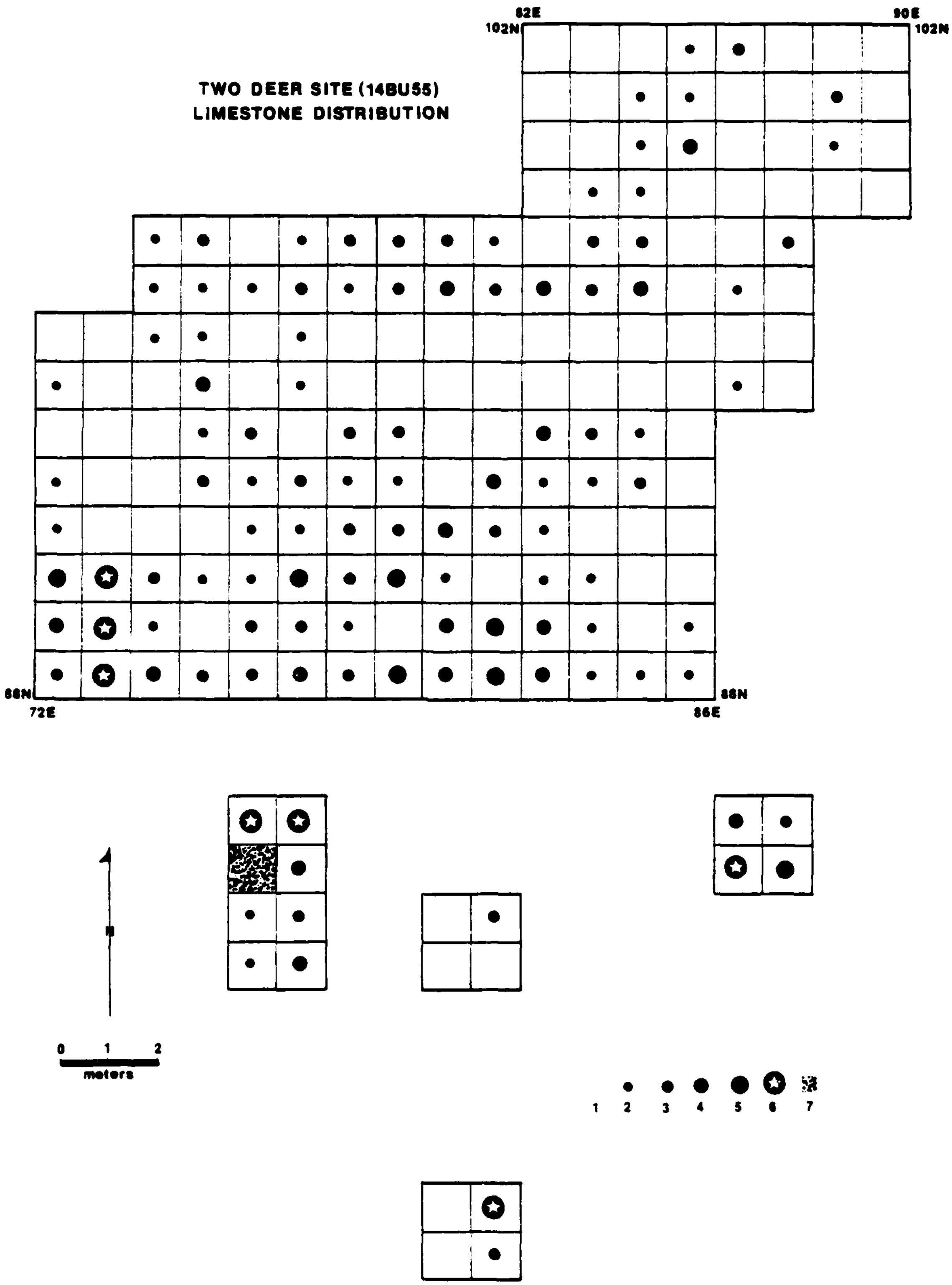

Figure 6.15. Limestone distribution, 14BU55. Legend: 1=empty units; 2=0.6-11.4gr (>0) or very low density; 3=11.7-47.5gr (>.5 s.d.) or low density; 4=54.9-111.6gr (>$\overline{X}$) or medium density; 5=124.4-172.8gr (>1 s.d.) or high density; 6=205.0-400.3gr (>2 s.d.) or very high density; 7=1644.5gr.

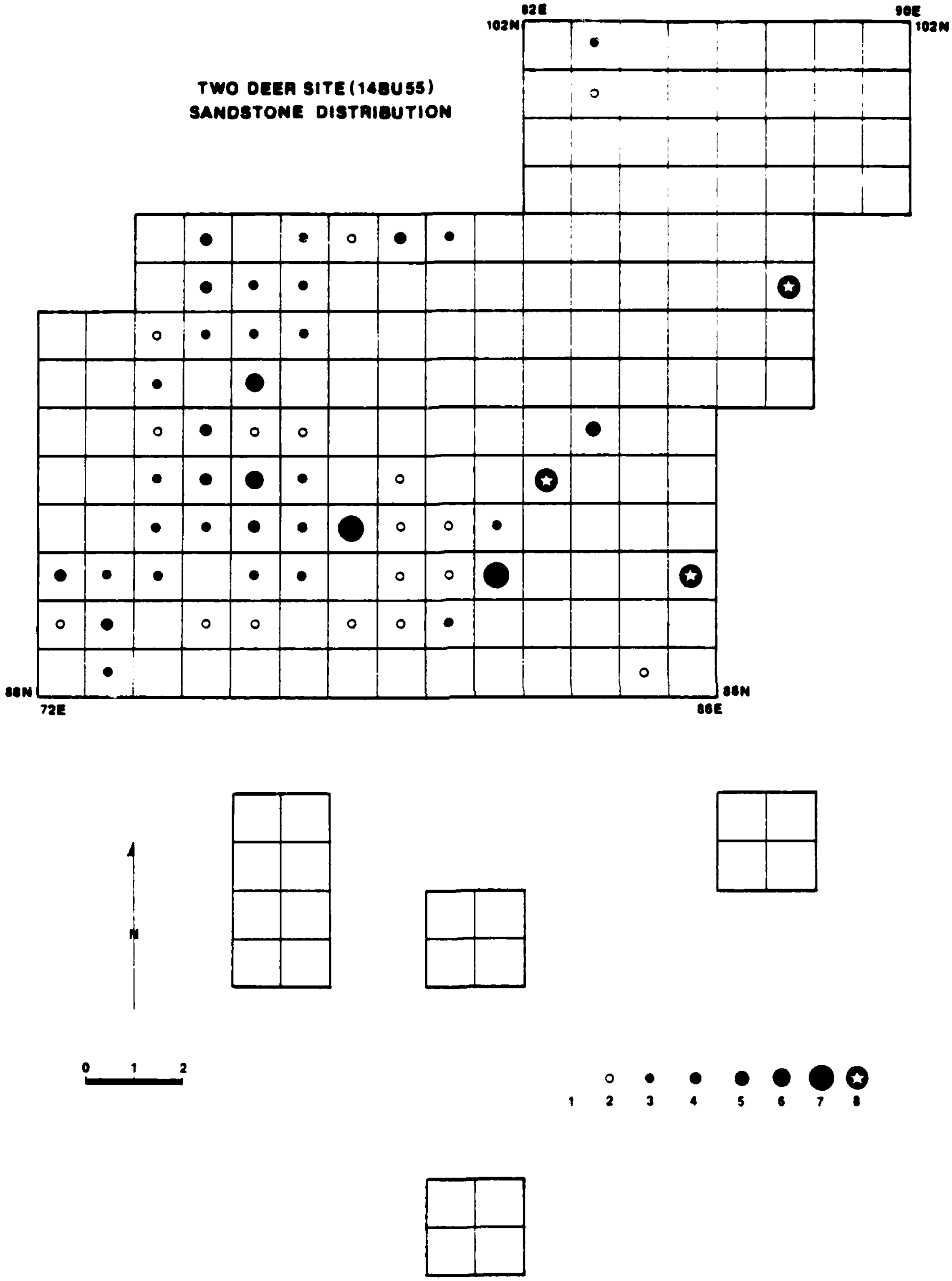

Figure 6.16. Sandstone distribution, 14BU55. Legend: 1=empty units; 2=0.7-3.0gr (>0) or very low density; 3=3.3-15.3gr (>.5s.d.) or low density; 4=18.8-39.5gr ($>\bar{X}$) or medium low density; 5=55.5gr (>1s.d.) or medium density; 6=76.4-89.1gr (>2s.d.) or medium high density; 7=104.6-106.7gr (>3s.d.) or high density; 8=344.0-419.2gr (>4s.d.) or very high density.

located in unit 33, corresponds to Feature 13, identified as hearth cleaning debris (Adair and Brown 1981). The total amount of limestone from this feature was relatively so high (1644.5 gr.) that it was not considered when the mean and standard deviation were figured. The high concentrations of limestone in the other units, however, makes for some interesting suggestions. First, the large amounts along the southern portion of the block excavation correspond to the areas of low artifact densities (see Fig. 6.9). The estimated limits of the structure were determined on the basis of the artifact distribution, suggesting that the limestone falls along the edge, or walls, of the structure. While post mold stains are lacking, the large amounts of limestone may have been used to support a post or wall of the house. Such a use for limestone has been noted to occur at the Anderson site at Wolf Creek (Rohn, Stein and Grover 1977:48) where a post stain was found beneath a limestone pile. As at the Anderson site, the lack of evidence of burned earth around the large pieces of burned limestone suggests that they were transported to their place of recovery after they had been heated at some other place.

The volume of limestone in units outside the block excavation offer less evidence for the post support suggestion. Feature 13 was originally suggested to be hearth cleaning debris, due to the absence of evidence for combustion in the vicinity. It is possible that the quantities of limestone in the units surrounding feature 13 and those in other southern units represent hearth cleaning material as well. Whatever their original use, these amounts are considered to be extramural.

The distribution of sandstone does not, however, follow the same pattern as that of limestone (Fig. 6.16), indicating that the two raw materials served different functions at the site. Except for the high quantities in two units on the eastern edge of the block, the sandstone is concentrated more towards the center of the structure. While one concentration of burned sandstone was uncovered towards the center of House 1 (Fig. 6.7), most were small, isolated pieces. The sandstone, therefore, cannot be suggested to have served as either post-supports or hearthstones but may have served a function in tool manufacture or food preparation. The possible uses of sandstone at the site will be discussed in following sections of this chapter.

Fauna

The representation of faunal remains is poor for the Two Deer site assemblage. Of the bone recovered, only a few elements were identified. Table 6.2 lists the taxa identified and the minimum number of individuals represented by those elements. With the exception of three deer antler tines, none of the identifiable remains are burned. All animals represented in this table are indigenous creatures in the local environment and are common in archaeological deposits in the El Dorado area.

The majority of the faunal remains consisted of small, unidentifiable fragments of burned bone. This amount totaled over 600 grams and was primarily located around the metates in the center of the house (Fig. 6.17).

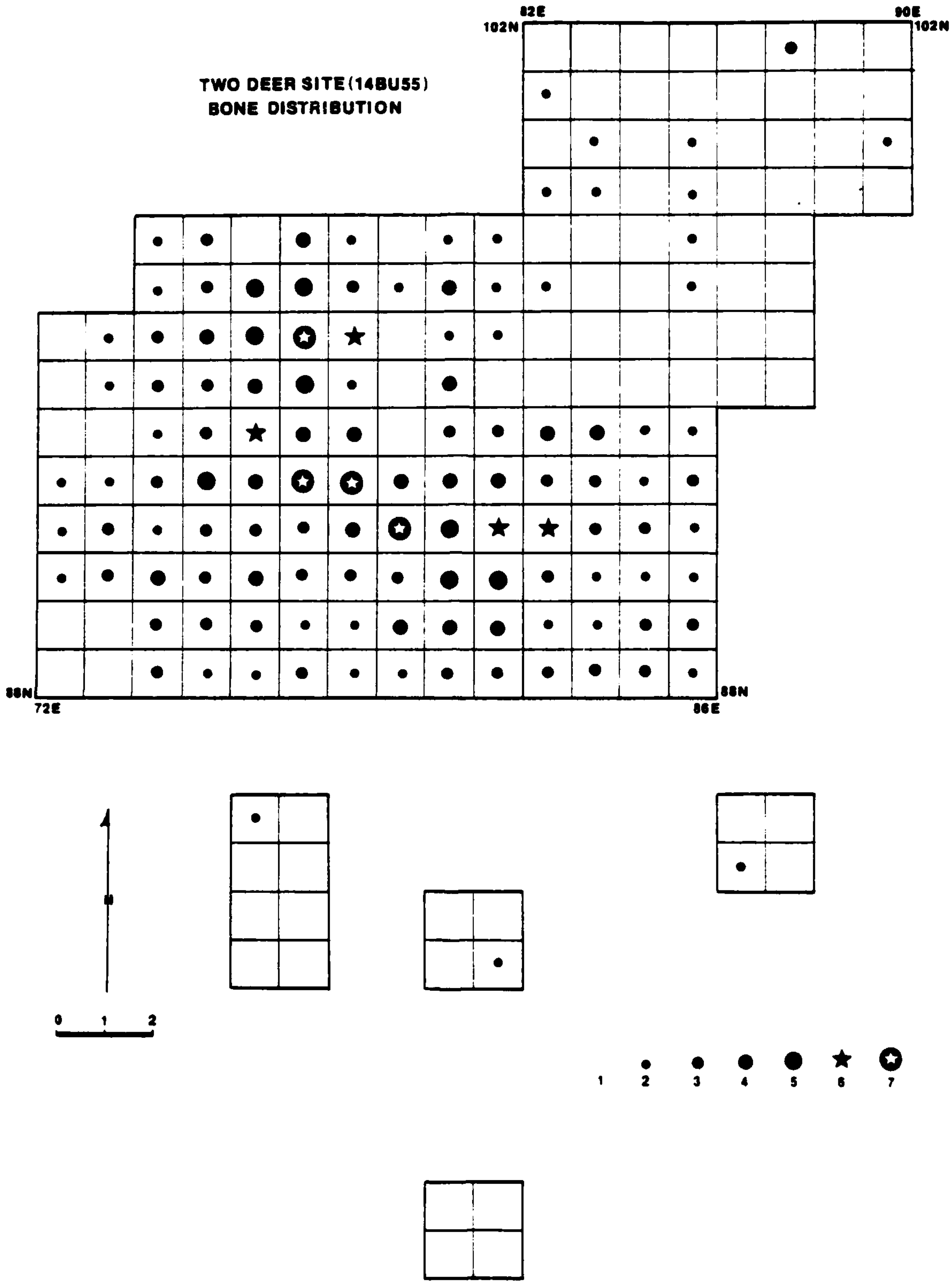

Figure 6.17. Bone distribution, 14BU55. Legend: 1=empty units; 2=0.1-1.6gr (>0) or very low density; 3=1.7-4.7gr (>.5s.d.) or low density; 4=5.0-10.8gr (>$\overline{X}$) or medium density; 5=12.2-17.3gr (>1s.d.) or medium density: 6=18.1-20.2gr (>2s.d.) or high density; 7=24.7-36.8gr (>3s.d.) or very high density.

Table 6.2. Taxa and minimum number of individuals determined from identifiable bone, Two Deer site.

Taxa	Element	MNI
Odocoileus sp. (deer)	2 auditory meatus fragments	3
	1 left astragalus	
	1 right astragalus	
	3 right proximal calcaneum fragments	
	1 tibia fragment	
	1 right distal metacarpal	
	1 right proximal radius fragment	
	2 left proximal ulna fragments	
	4 molars or premolars	
	1 basal antler fragment	
	5 antler tines	
	1 antler shaft	
	1 metapodial condyle	
Procyon lotor (raccoon)	1 mandibular incisor	1
	1 mandible fragment	
	1 left mandible	
Castor canadensis (beaver)	1 molar	1
Sylvilagus sp. (rabbit)	1 vertebrae	1
Bison sp. (bison)	1 tibia fragment	1
	1 sesamoid	
	1 right cuboid	
Turtle	3 carapace fragments	1

While bone processing may account for the fragmented nature of this assemblage, the high incidence of burned, fragmentary bone at the Two Deer site may also be explained by the pottery. More than 80% of the pottery is tempered with crushed, burned bone. The high incidence of burning and the small size of the fragments seems to indicate that the bones were first processed and broken into small fragments and then burned. Those pieces which were then to be used as temper were further crushed.

Flora

The floral remains from the Two Deer site are one of the more interesting assemblages. In addition to a diversified taxa of native species, flotation recovered several species of tropical cultigens. These included corn (Zea mays) and squash or pumpkin (Cucurbita pepo). In addition, native sunflower achenes (Helianthus annuus) and marshelder (Iva annua) are large enough to be considered of a cultivated variety. The co-occurrence of native and tropical cultigens has not, to my knowledge, been previously recorded for a site of this time period in south-central Kansas.

This suggests that agriculture was practiced prior to the Central Plains tradition, the conventional time period for the introduction of agriculture. In fact, the occurrence of four cultigens, both tropical and native, suggests a well developed subsistence base and indicates that agriculture had been adopted by prehistoric peoples in the area prior to the occupation at Two Deer. As yet, there is no evidence to suggest that Two Deer represents an occupation of migrating people who brought agricultural foods with them to the Lower Walnut valley.

Identified species of flora from the flotation matrix are presented in Table 6.3. The taxa represented in this assemblage indicate that the prehistoric inhabitants exploited a variety of locally available foods while concentrating on goosefoot (Chenopodium spp.), spurge (Euphorbia spp.), black walnut (Juglans nigra), and acorns (Quercus sp.).

Spatial Patterning

As mentioned in the Introduction, the quantity of cultural material remains within House 1 and the apparent lack of such material outside of the structure allowed for an analysis of the spatial patterning of this material. Such an analysis has recently been termed proxemics, or paleoproxemics, which focuses on human behavioral processes responsible for change, allocation and utilization of space (Watson 1969, 1970; Fletcher 1977). In a recent paper, Wilcox (1979) points out the variability in spatial analysis from broad, intersite analyses to those aimed at reconstructing spatial behavior within a single site. The latter analyses are more commonly referred to as intra-site or micro-level analyses. In addition to variety in scope, there is an array of analytical techniques, which range from complex, and perhaps inappropriate (Wilcox 1979:3), to basic and fundamental.

It is the basics that are presented in this chapter, as this is the most appropriate place to begin a micro-level spatial analysis. While further analysis of the material from Two Deer will be undertaken, the focus here is on simply defining the spatial nature of the material recovered from House 1. Computer generated distribution maps and chloropleth maps of non-three dimensionally plotted materials provide a basic descriptive approach to defining high density areas of certain material culture remains within the structure.

As necessary when using techniques of spatial analysis, this study begins with several assumptions. First and most fundamental, it is assumed that defined camp-site activities took place within the house at Two Deer and that the recovered material culture remains are representative of these activities. Exactly how clearly these activities and related spatial areas are defined becomes, in part, a methodological problem. Second, the two metates are assumed to be associated with a specific set of behavioral functions. The fact that they were located in the same area in the house argues for spatially discrete activity areas. This strengthens the first assumption that various activities are associated with certain tools. Their central location within the structure allows for the third assumption that activities within the house evolved around the features while not always being directly associated with them.

Table 6.3. Identified genera of carbonized flora, Two Deer site.

Name	Count	Common Name
Agastache nepetoides	1	giant hyssop
Amaranthus spp.	876	pigweed
Ambrosia spp.	7	ragweed
Arenaria sp.	1	sandwort
Asimina triloba	1	pawpaw
Chenopodium hybridum	171	maple-leaved goosefoot
Chenopodium sp.	2409	goosefoot
Crataegus viridis	1	red haw
Crotalaria sp.	1	rattle box
Dianthus armeria	13	pink
Eupatorium sp.	2	thoroughwort
Euphorbia sp.	241	spurge
Galium sp.	20	bedstraw
gramineae	139	unknown grasses
Hypericum perforatum	31	St. John's wort
Ipomea sp.	25	morning glory
Kochia scoparia	6	firebush
Lactuca sp.	1	wild lettuce
Oxalis dillenii	1	wood sorrel
Panicum sp.	26	panic grass
Parthenocissus sp.	3	Virginia creeper
Physalis sp.	1	ground cherry
Phytolacca spp.	19	pokeweed
Polygonum sp.	4	smartweed
Portulaca spp.	31	purslane
Prunus virginiana	1	plum
Rumex sp.	1	dock
Scirpus sp.	31	bulrush
Setaria glauca	13	yellow foxtail
Silene sp.	2	catchfly
Smilax sp.	3	greenbrier
Solanum rostratum	1	nightshade
Stellaria sp.	13	chickweed
Symphoricarpos sp.	8	coralberry
Viburnum sp.	7	blackhaw
viola sp.	16	violet
Vitis sp.	11	grape
Iva annua	12	marsh elder
Helianthus annuus	195	sunflower
Cucurbita pepo	31	pumpkin/squash
Zea mays	114	corn
Celtis sp.	2	hackberry
Juglans nigra	3901/75.9g	black walnut shell
	149/ 8.5g	black walnut meat
	627/ 8.4g	black walnut husk
Carya sp.	62/ 4.4g	hickory shell
Quercus sp.	151/ 8.5g	oak shell
	2/ .3g	oak meat
	2/ .2g	oak cup

Table 6.3 (continued)

Name	Count	Common Name
unidentified nutshell	576/18.9g	
unidenfied seeds	1918	
unknown seeds	576	

TOTALS:

seeds	4490 (identified) / 6984 (total recovered)	
nut shells	4116 / 88.8g (identified) / 4692 / 107.7g (total recovered)	
meat	151; 8.8g	
husk	627; 8.4g	
cup	2; .2g	

The prepared maps and related discussion that follow concern the chipped-stone tools and ceramics in an attempt to define areas of tool manufacture or rejuvenation and food preparation. The computer maps, simple two-dimensional scattergrams, are one of the most basic and most easily comprehensible visual devices that can be used in a descriptive presentation. The scattergrams presented in this chapter were drawn on a Hewlett-Packard HP-7221A digital plotter supported by interactive FORTRAN programs adapted for the Two Deer site.

The chloropleth maps used in conjunction with the scattergrams were prepared to provide visual evidence of the densities of non-three dimensionally plotted materials. The exception to this case is the pottery distribution map. The various pottery groups shown in this map represent densities of plotted and non-plotted fragments combined. Since a size criteria was used in the plotting of ceramic fragments due to the large quantity of such material, many small pieces were simply not plotted and the density groups may have been significantly different without including the small pieces.

All density groups for all maps were, however, prepared in a similar manner. As with the bone, daub, limestone and sandstone maps presented previously, all density groups were determined by first collapsing the arbitrary excavation levels, adding all quantities of a certain material, then determining the statistical mean and standard deviation. Again, as most distributions tended to be log-normal, a majority of the units were represented in the one standard deviation group below the mean. Since this did not adequately display areas of very low density, the 0-1 standard deviation group was divided into two groups, 0-.5 standard deviation and .5 standard deviation to the mean. Unlike the previous planar chloropleth maps, however, the density groups in the following maps on debitage, chips, and pottery distribution, include those units that did not contain any material. In other words, there is no single group representing empty units, as very few units fell into this category.

Chipped-Stone Tools

Approximately 1300 chipped-stone tools and 16,500 pieces of debitage were recovered from the block excavations at Two Deer. This debitage figure excludes the many small flakes and chips recovered from flotation.

Several tool types were selected for planar distribution maps for this section. This includes the most abundant categories of projectile points, non-hafted bifaces, cores, retouched chips and flakes, scrapers, notches, gravers, and perforators. As the chipped-stone tools have been classified by techo-morphological characteristics rather than inferred function, the distribution of these tool types was not intended to demonstrate areas of a particular activity. Rather, the intent is to provide visual evidence of how certain tools are distributed throughout the structure. Figure 6.18 displays the planar distribution of non-hafted bifaces, projectile points and cores in relation to each other. These tools are distributed throughout the block in varying densities. While the tools seem to be evenly dispersed around the two centrally located metates and the small hearth, several prominent high and low areas are noticeable. There is first an obvious lack of material in the northeastern portion of the block and several smaller empty pockets in the southeast, southwest, and northwest corners. On the opposite side, there are small areas of concentrated tools, the most obvious one being the arrangement of bifaces to the upper right of the metates. This may be more accurately shown by computing a measure of distance between artifacts of a certain type, thus displaying areas of specific tool density. This analytical procedure, however, is left for future analysis.

Figure 6.19 illustrates the arrangement of certain unifacial tools. In this arrangement, the retouched chips, flakes, and scrapers are concentrated in the south and southwestern portions of the block. While a small concentration of tools is found to the upper right of the metates, it is not as pronounced as the previous arrangement of bifaces. The final map (Fig 6.20) displays even less of the spatial arrangement of specific tools. Here, notches, gravers, and perforators are plotted. Gravers tend to be localized in the southern portion of the block while the two perforators are relatively close together in the southeastern portion of the same area. Notches, however, are widely dispersed throughout the block excavation.

Density distribution maps were prepared for the debitage. These maps were then compared to the planar distribution of specific tools to note areas of high tool/debitage densities. Figure 6.21 illustrates the debitage distribution, which includes all flakes, chips, shatter, and potlids recovered from excavations. The isolated test units in the southern portion of the map were included in these distributions for several reasons: 1) cultural material, while not abundant, was found in these units, and 2) a display of the very low density of cultural material in these units reinforces the density of material within the structure and clearly shows the rather abrupt change in the patterning of the material between the two areas.

According to the standard deviation divisions, a majority of the units (approximately 46%) contained 20 or fewer pieces of debitage. This represents $85m^2$ of the excavated area and is referred to as a "very low density."

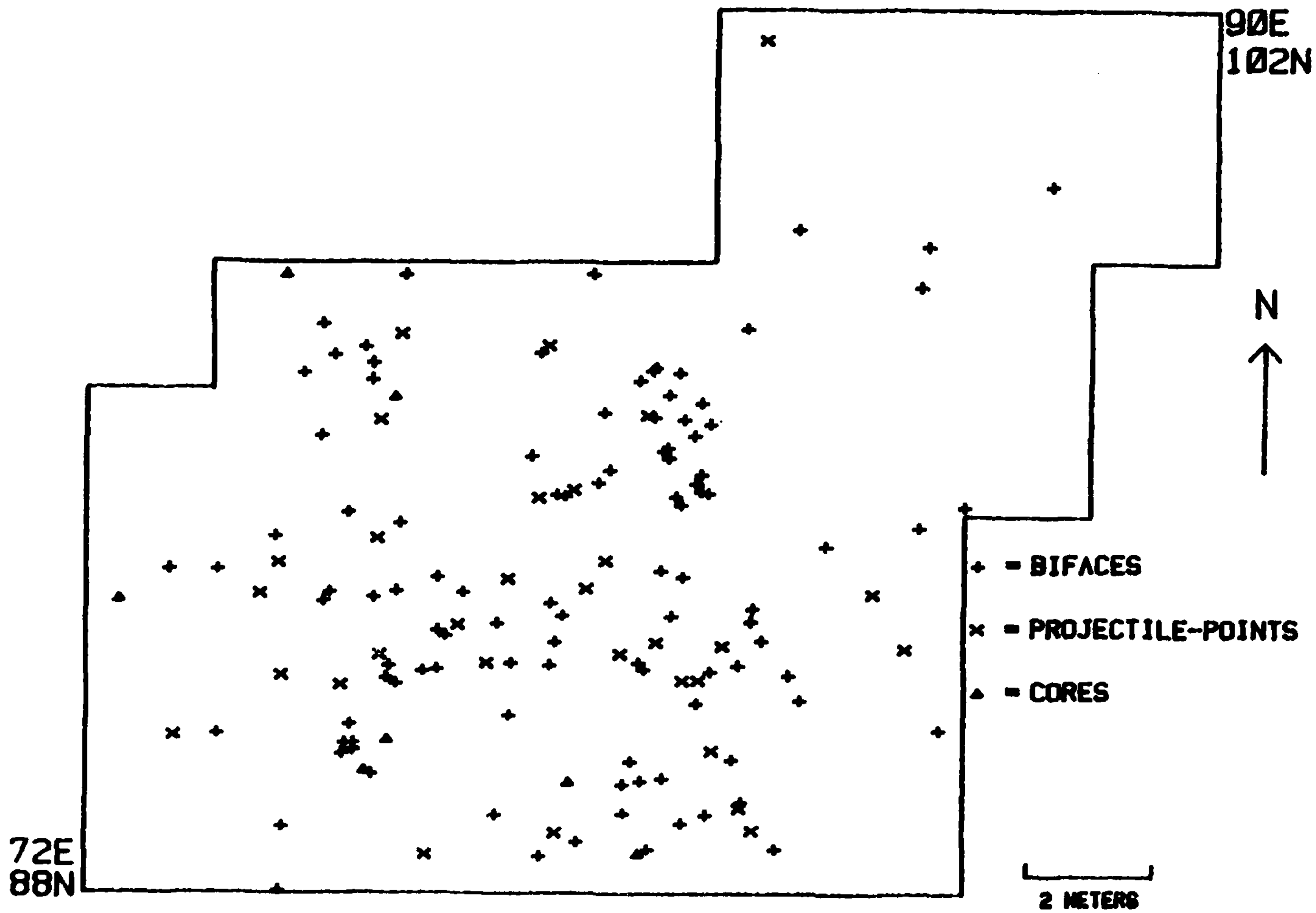

Figure 6.18. Planar distribution of projectile points, non-hafted bifaces, and cores within the block excavation, Two Deer site.

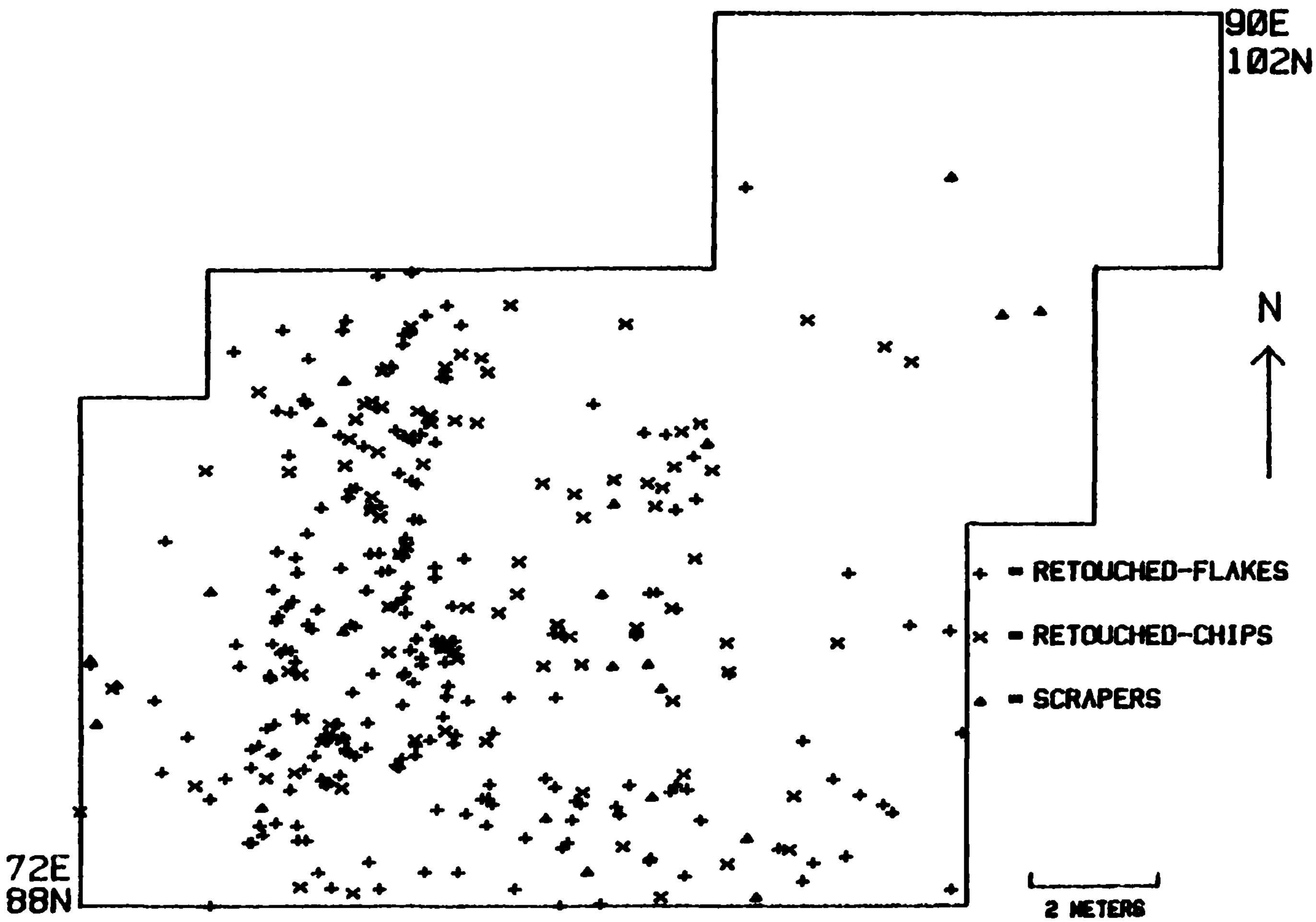

Figure 6.19. Planar distribution of retouched flakes, retouched chips, and scrapers within the block excavation, Two Deer site.

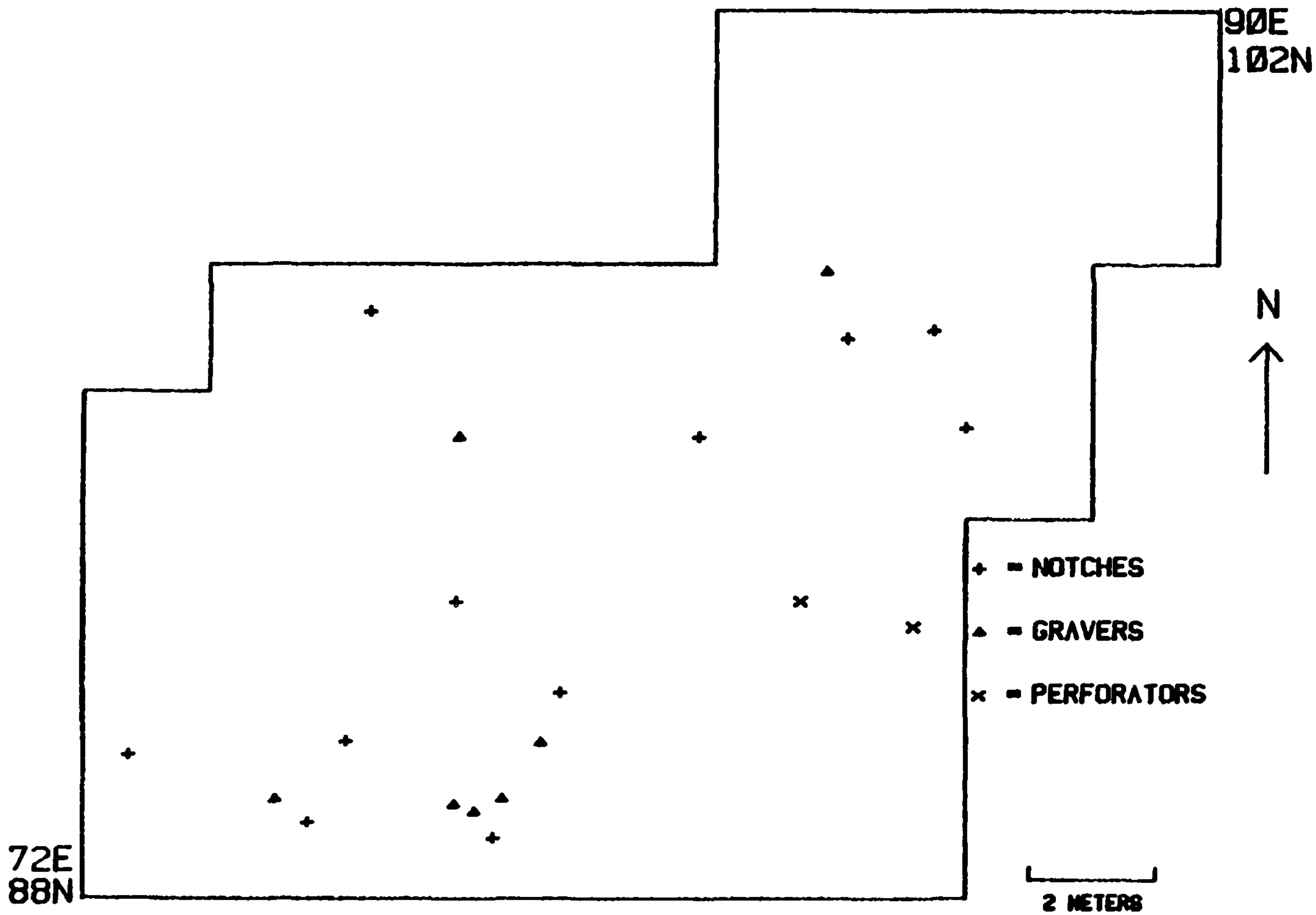

Figure 6.20. Planar distribution of notches, gravers, and perforators within the block excavation, Two Deer site.

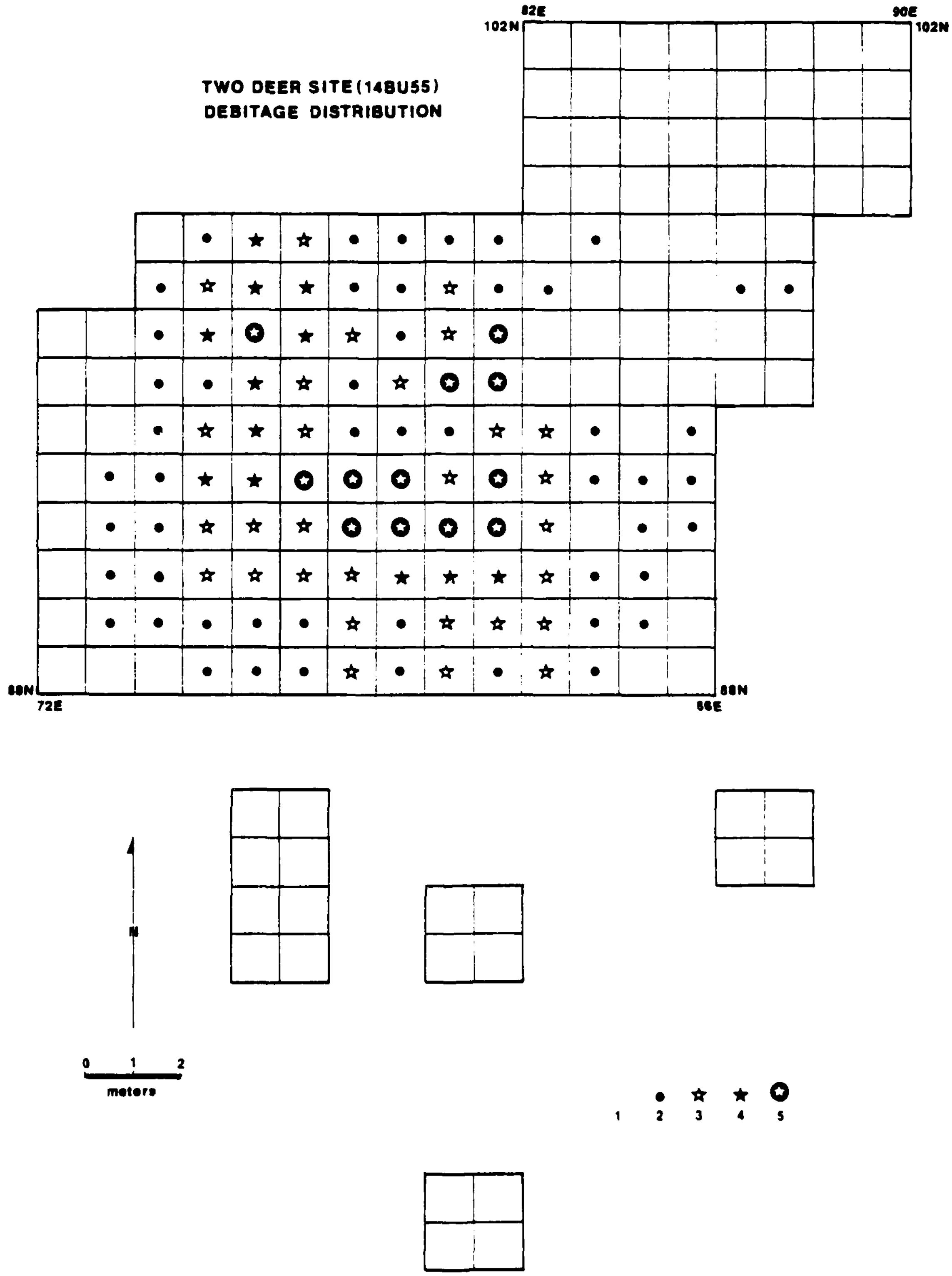

Figure 6.21. Debitage distribution, 14BU55. Legend: 1=0-20 pieces (>0), or very low density; 2=21-77 pieces (>.5s.d.) or low density; 3=81-170 pieces (>$\overline{X}$) or medium density; 4=194-286 pieces (>1s.d.) or high density; 5=323-672 pieces (>2s.d.) or very high density.

These very low density units are distributed coterminously in three areas of the excavation. The first and the most prominent is located in the northern third of the block, within the area labeled House 2. The second area consists of units on the western edge of the block, which help define the limits of House 1. The final units, while not entirely coterminous, are the southern units outside of the block excavation. Even combined, these $20m^2$ still contained less than 20 pieces of debitage.

The second most frequent occurring density interval, or low density, is represented by $51m^2$, or 27% of the excavated area. These units contain between 21-77 pieces. Low density units are found primarily adjacent to the very low density units and, for the most part, circumscribe the limits of House 1. A few low density units are found in the center of the structure, at about the location of the metates.

The next highest density interval, medium, contains those ($27m^2$-14%) units whose totals center around the mean. These units each contain 81-170 pieces. These units tend to be more evenly dispersed throughout the block but are generally found in small groups or patches approximately three to six square meters in size.

The fourth density level, or high density, is represented by even fewer units ($13m^2$ or 7%), each with 194-286 pieces of debitage. This density represents the quantity which is greater than the mean but less than one standard deviation above the mean. The units in this interval are found clustered in three small groups throughout the block, generally more towards the center than the previous level.

The final density level (very high) includes units with 323-672 pieces. They are few in number ($12m^2$) and are located towards the interior of the structure in small groups. The largest group contains $8m^2$ and is distributed along an east-west axis across the approximate center of the excavation. The second group of $3m^2$ is located just to the north of the first group while the third is found more on the western side and is represented by only $1m^2$ unit.

Table 6.4 was prepared to display the relative numbers of chipped-stone tools in each of the debitage density intervals. A density index was determined, which is a measure of the relative numbers of chipped stone artifacts per each debitage density level. It was determined by dividing the total number of tools by the square meters for that particular interval. There is a significant tendency for the highest debitage density level to also contain a proportionately higher number of artifacts, thus creating a higher density index figure. In other words, there is a greater chance of finding a chipped stone artifact in one of these very high density units than in any other debitage density interval. In addition, the density index becomes proportionately higher as one moves from the very low debitage density interval to the highest interval, suggesting that chipped stone tool recovery becomes better as the amount of debitage increases.

The figures presented in Table 6.4 suggest that the debitage densities in particular units represent more than just areas of discarded

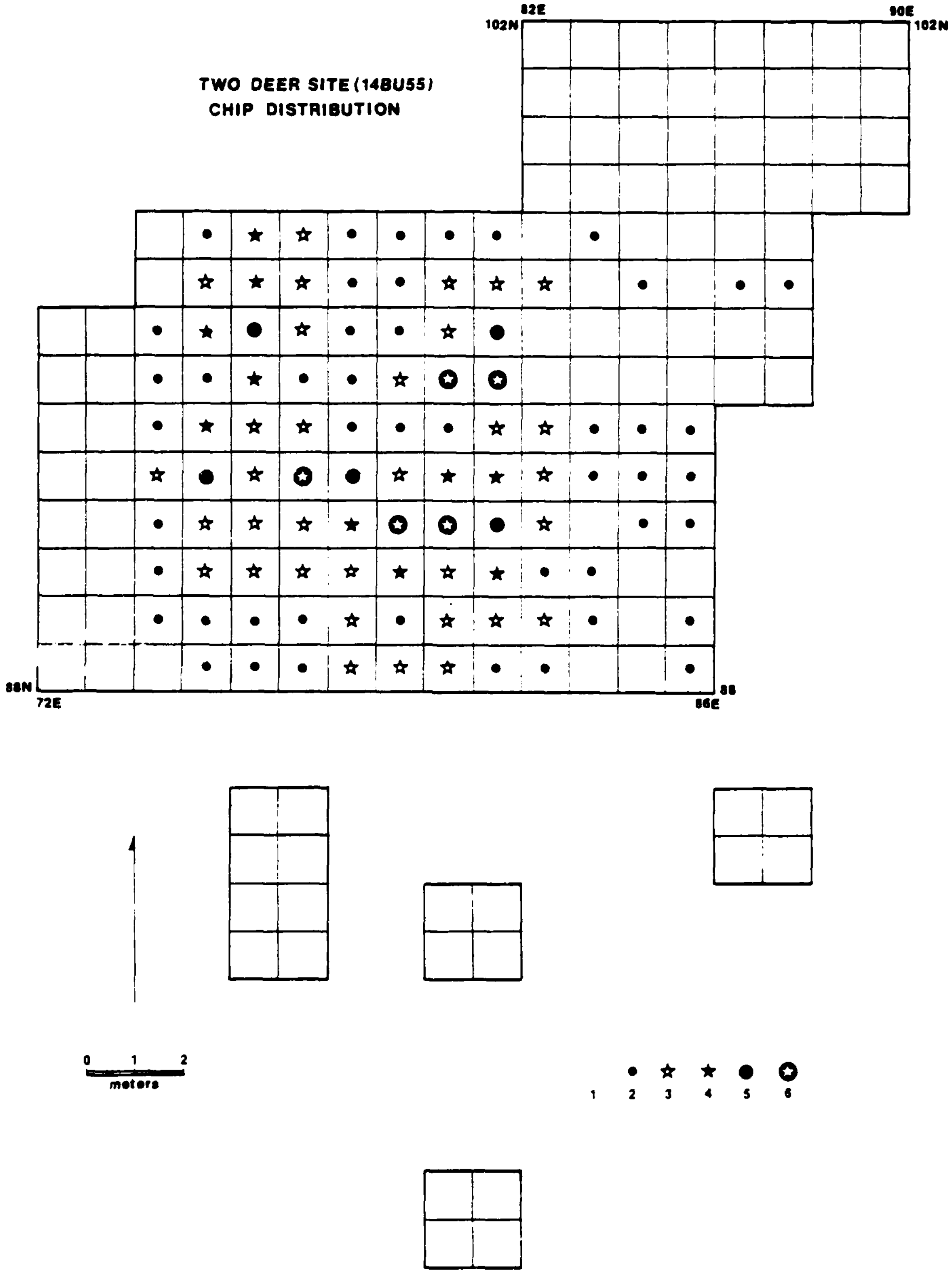

Figure 6.22. Chip distribution, 14BU55. Legend: 1=0-8 pieces (>0) or very low density; 2=9-39 pieces (>.5s.d.) or low density; 3=43-101 pieces (>$\bar{x}$) or medium density; 4=102-163 pieces (>1s.d.) or medium high density; 5=165-212 pieces (>2s.d.) or high density; 6=229-366 pieces (>3s.d.) or very high density.

Table 6.4. Summary table of number of chipped-stone artifacts and square meters associated with each debitage density interval.

Debitage Density Interval	Square Meters	Number of Chipped-Stone Artifacts	Density Index
0-20 very low	85	130	1.5
21-77 low	51	278	5.5
81-170 medium	27	317	11.7
194-286 high	13	184	14.1
323-672 very high	12	290	24.2

by-products of tool manufacture. Instead, they should be viewed as areas of tool manufacture, tool resharpening, or a raw material supply depository for the production of additional tools. The fact that the highest density areas are located toward the center of House 1 further suggests that these may have been dominant activities inside the structure for the prehistoric inhabitants. There is, however, some caution that should be expressed. It has been suggested that House 1 was destroyed when it collapsed, possibly due to fire (Adair and Brown 1981). Approximately five kilograms of burned clay daub were recovered primarily from the center of the structure, the same areas as the high debitage densities. If the structure collapsed while it was still occupied, it can be theorized that a portion of the cultural materials remaining inside were broken and shattered by the falling roof and walls. It can be further suggested that the high amounts of shatter (35%) in the debitage category are, in part, a result of this occurrence. A possible correction to this problem is simply to exclude the shatter and re-figure the debitage density. In addition, if the high debitage/tool density units are actually areas of tool manufacture and/or resharpening, then one might expect a higher amount of chips than any other form of debitage. This is especially significant since the majority of bifacial tools recovered from Two Deer are micro-level tools (less than 20 mm. in length). Indeed, a high percentage of chips in the debitage category (46%, see Table 6.1) attests to the fact that these small flakes were the most dominant by-product in tool manufacture.

Figure 6.22 therefore presents a planar distribution of the arrangement of chips throughout the excavation. The density intervals are about the same as for the previous map, although an additional interval (medium high) was added. This figure more clearly displays areas of high and low densities, with the high density units being in the same approximate location, only fewer in number. Again, a table depicting the relative amounts of chipped stone artifacts in each chip density interval was prepared (Table 6.5). This again indicates that the units of high chips and high chipped stone tools co-occur, strengthening the suggestion that these areas are more than mere trash piles. Instead, they represent distinct areas of tool manufacture or resharpening. An interesting point for future

Table 6.5. Summary table of number of chipped stone artifacts and square meters associated with each chip density interval.

Chip Density Interval	Square Meters	Number of Chipped-Stone Artifacts	Density Index
0-8 very low	84	130	1.5
9-39 low	50	272	5.4
43-101 medium	34	428	12.5
102-163 medium high	10	149	14.9
165-212 high	5	105	21.0
229-366 very high	5	115	23.0

analysis would be to compute the percentages of complete vs. broken tools for each of the debitage density intervals.

The distribution of sandstone, discussed in a previous section of this report, was compared to the distribution of debitage and chipped stone tool density. As a few pieces of sandstone exhibited shallow grooves indicative of their use as abraders, it was theorized that the use of these fragments in the manufacture of chert tools would cause a similarity in the distributions of sandstone, debitage, and tools. Unfortunately, there is not a strong enough correlation between these distributions to strengthen such a suggestion. A comparison between the distribution maps of debitage and chips to that of sandstone (Fig. 6.16) indicates that two of the three very high density intervals of sandstone are located some distance from the very high density units of debitage and tools. The purpose of the sandstone in these two units is difficult to speculate on, as they do not co-occur with any other cultural material densities, do not show signs of being worked, and are relatively large fragments. However, the third unit in the very high density interval of sandstone and the four units in the high and medium high intervals are all located adjacent to units of very high or high levels of debitage and tools. It is, therefore, slightly possible that these deposits of sandstone were intentionally placed in proximity to the areas of tool manufacture so as to be used in conjunction with this activity. While the presence of worked sandstone fragments in these deposits adds some strength to the suggestion, additional evidence is needed before it can be accepted.

Ceramics

The ceramic collection from the Two Deer site is one of the largest from any site in the area. In addition, a majority of the fragments recovered were large enough to be three-dimensionally plotted (>2 cm. in any direction) and nearly all were found within the estimated boundaries

of House 1. Any activity involving the use of pottery, then, should be represented in the distribution of this material. It is admittedly difficult, however, to decipher activities from ceramic fragments. Unlike chipped stone tools, pottery is a utilitarian object which can have a variety of purposes. Conceivably, any activity which would involve the transportation of materials from one area to another or the storage of materials for any length of time could involve the use of pottery. In addition, it was demonstrated (Adair and Brown 1981:Fig. 5.12) that cross-mended fragments are widely dispersed throughout the structure. It is no surprise, then, that the distribution of pottery within the excavation appears as it does (Fig. 6.23). Aside from the heavy concentration of fragments in the center of the structure which represents one vessel, obvious areas of high density are lacking.

Due to these complexities at Two Deer, the pottery does not lend itself quite so easily to spatial analysis as did the debitage and chipped stone tools. This does not mean, however, that such an attempt would be futile. Rather, such an analysis can be most interesting if the pottery is allowed to simply "speak for itself." First, just because obvious areas of high ceramic densities are not readily visible in a planar distribution, does not mean that concentrated areas do not exist. One fault of a planar distribution map such as Fig. 6.23 is that ceramic fragments with identical or very similar horizontal coordinates but dissimilar vertical coordinates appear as one, thus giving a visual appearance of little material. In addition, a concentration is only a relative phenomenon, such that two isolated ceramic sherds in a corner of an excavation can be referred to as forming a concentration. As a means of isolating areas of "high" and "low" concentration at Two Deer, a chloropleth distribution map was thought to be the best approach. Second, Fig. 6.23 only displays the three-dimensionally plotted fragments while many more pieces have been recovered from excavation. While these additional pieces are small, they are nevertheless important. And third, high density areas are not the only point of interest in distribution maps. Fig. 6.23 clearly shows areas of low ceramic density. These areas may be important in comparison to the distribution of other material culture.

Figure 6.24 was prepared to provide a more accurate display of the pottery arrangement. Both plotted and non-plotted fragments are included, and, as with the previous chloropleth maps, the divisions are according to standard deviation.

The first density interval (very low density) is represented by $75m^2$ which contain 2 or fewer (including 0) fragments. These very low density units are distributed about the excavation in varying coterminous clusters. One interesting cluster includes $6m^2$ and is located towards the center of the structure. This low density area corresponds to the very high density area of debitage, indicating that high density areas of debitage and pottery do not co-occur.

The second density level includes $58m^2$, or 31%, of the total excavation. Pottery fragments vary from three to seven. These low density units are dispersed throughout the excavation, which includes several units in one of the southern test units.

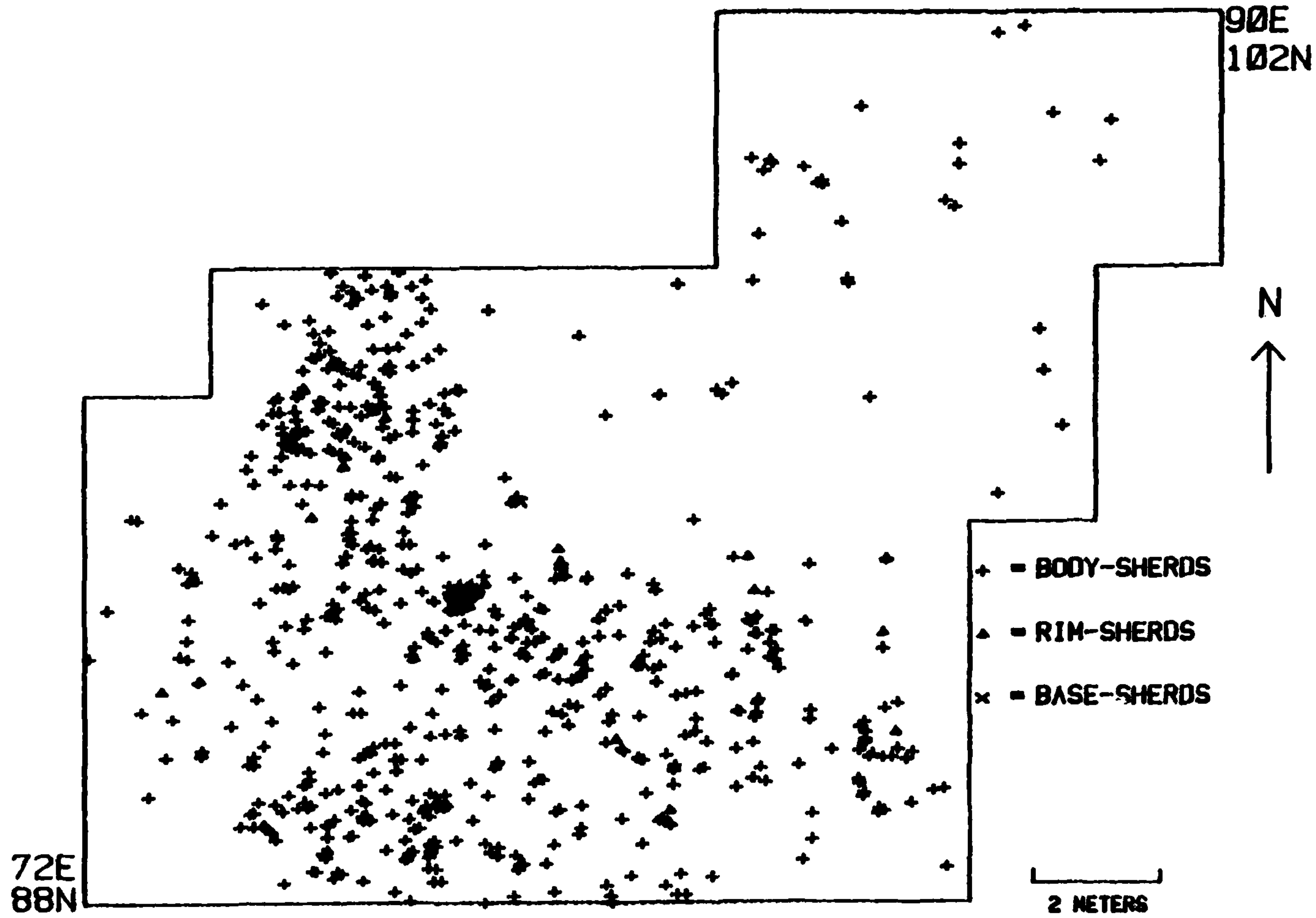

Figure 6.23. Planar distribution of ceramic fragments within the block excavation, Two Deer site.

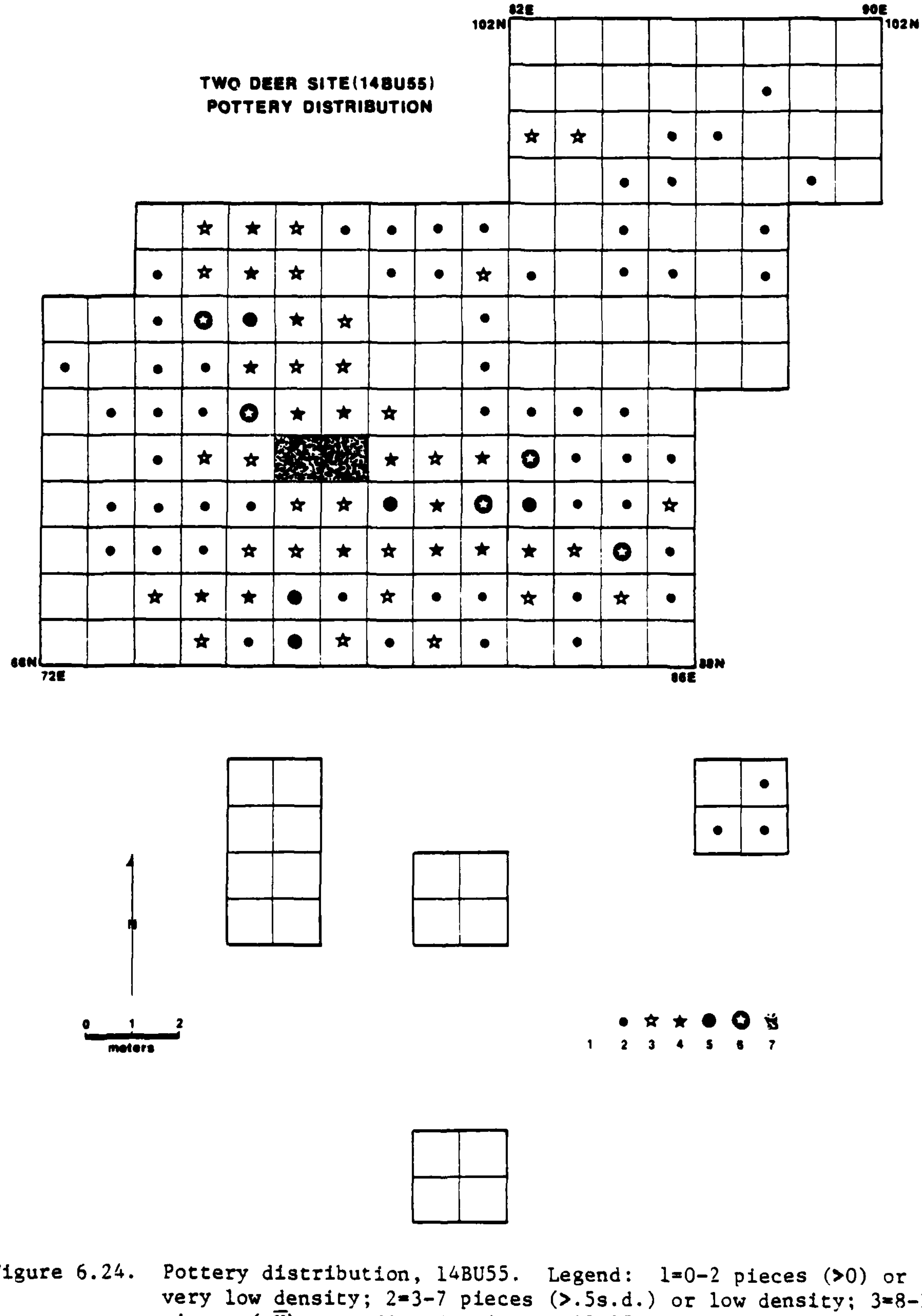

Figure 6.24. Pottery distribution, 14BU55. Legend: 1=0-2 pieces (>0) or very low density; 2=3-7 pieces (>.5s.d.) or low density; 3=8-17 pieces (>$\overline{X}$) or medium density; 4=18-27 pieces (>1s.d.) or medium high density; 5=28-34 pieces (>2s.d.) or high density; 6=38-46 pieces (>3s.d.) or very high density; 7=588 pieces.

The third most frequently occurring density interval, or medium density, is represented by $28m^2$, or 15% of the excavated area. These units contain 8-17 pieces and are also dispersed throughout the excavation. It is interesting to note that several units in this density interval are along the southern edge of the block excavation. This may be due, in part, to the fact that ceramic fragments were tossed or scattered about after the vessel was broken.

A medium high density level is the fourth interval which includes units with 18-27 pieces. Fifteen square meters, or 8% of the excavation, are within this interval. As with previous intervals, the units in this group are also randomly dispersed.

The fifth interval, or high density, is represented by only five square meters, each of which contain 28-34 pieces. Two of the units are coterminous and are found on the southern edge of the excavation adjacent to units of lower densities.

A very high density interval is represented by the sixth symbol. The $5m^2$ in this group contain between 38-46 pieces. While none of the units are coterminous, three are situated in relatively close proximity to each other on the eastern half of the excavation. The remaining two units are on the western half and are likewise separated by only a short distance from each other.

The seventh symbol presented in Fig. 6.24 is not actually a valid interval. The pottery fragments in the two units represented were not added to the total when the mean and standard deviation were figured. As these units combined contained 588 fragments, their addition to the total would have overpowered the remaining units and altered the density intervals significantly. These two units contain the fragments from one vessel whose pieces have remained confined in a small area but are too fragmented for vessel reconstruction.

A comparison between the distribution of pottery and that of the debitage and chipped stone tools (Fig. 6.25) indicates that the two areas are not entirely separate. A strong reason for this is possibly related to the fact that broken ceramic vessels were widely distributed throughout the house while the tools tended to be more concentrated with the debitage. On the other hand, one would expect some overlap in the distributions if the chipped stone tools were used in the butchering and processing of food and pottery was used in food preparation and cooking. This may be particularly true at Two Deer, as high density levels of both pottery and tools are found adjacent to the metates and hearth.

There is, however, some distinction between areas of high pottery and areas of high debitage and tools. The most obvious area is located just north of the metates and small hearth where pottery content is very low and debitage-tool content is very high. The main excavation unit in this area, unit 39, contained over 70 chipped stone tools, consisting primarily of bifacial tools. Another high pottery, low-debitage-tool area is located towards the southeastern corner of the excavation while a third is found in the northwestern portion of the block.

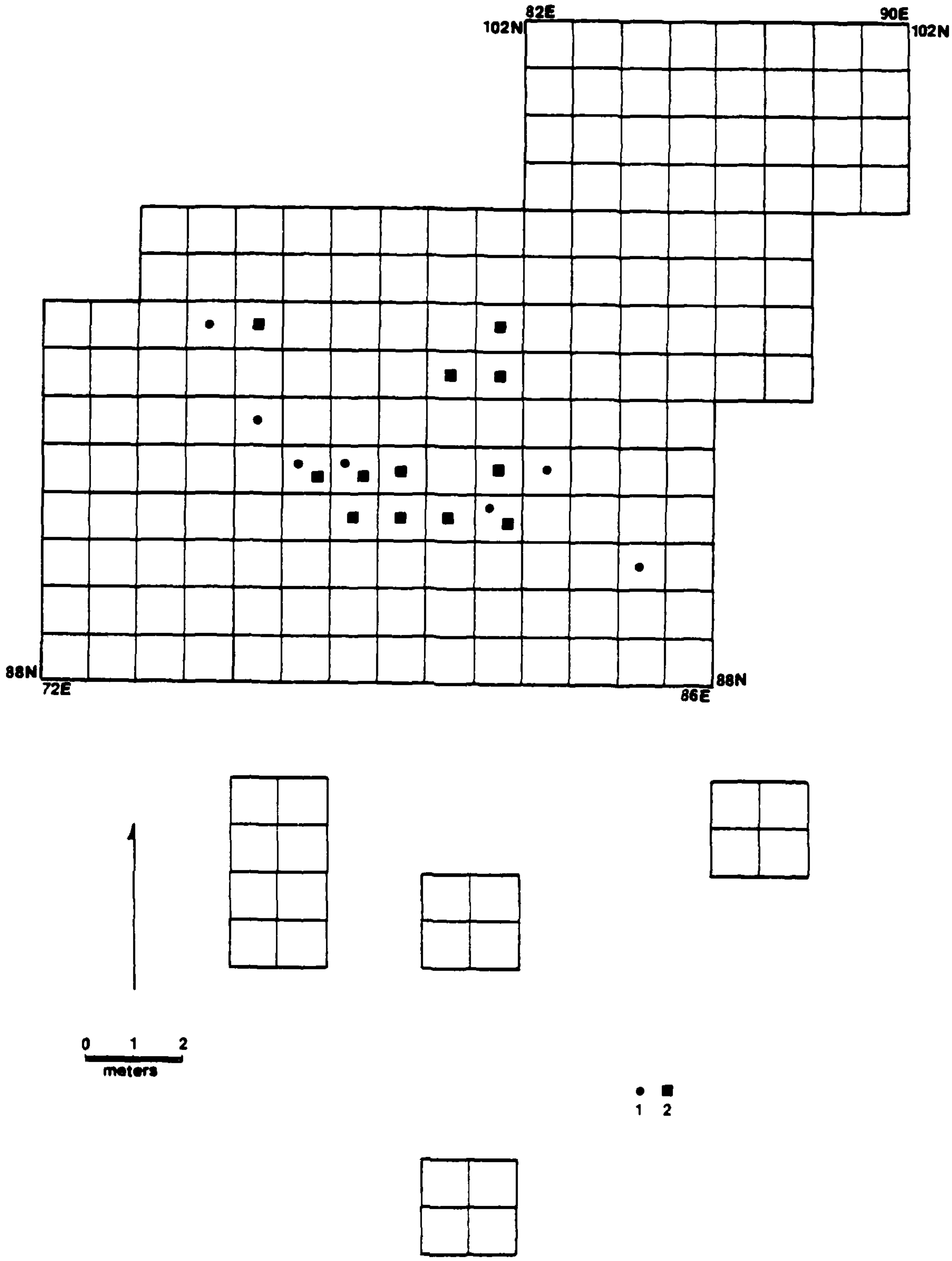

Figure 6.25. Summary map showing high levels of pottery vs. debitage and tools. Legend: 1=units of very high pottery densities; 2=units of very high debitage densities.

While pottery may serve a variety of purposes, it has traditionally been associated with food preparation. If this is a primary function of pottery, one might expect it to be associated with other material involved in the same activity. The distribution of the fauna is the most likely to use in a comparison with ceramics. A planar distribution map of plotted bone fragments and large charcoal pieces is presented in Fig. 6.26. This map actually provides little information, except to display the fairly wide distribution of bone and charcoal. A better display of the association between fauna and pottery can be made by using the total weights of bone from each unit, thus combining the plotted elements depicted in Fig. 6.26 with the greater quantity of smaller, unidentifiable fragments. The association between bone weights per $1m^2$ units and ceramic fragments is presented in Table 6.6, where the density index pertains to the probability of locating a heavy quantity of bone fragments in units of varying ceramic density. The index indicates that as the pottery density increases, so does the weight of bone fragments. This suggests that the units of high pottery fragments are, like debitage, not just trash deposits, but actually reflect definite activities performed by the prehistoric inhabitants.

Table 6.6. Summary table of total weight of bone and square meters associated with each pottery density interval.

Pottery Density Intervals	Square Meters	Total Weight of Bone Fragments	Density Index
0-2 very low	75	42.0 gr.	.6
3-7 low	58	115.1	1.9
8-17 medium	28	136.5	4.9
18-27 medium high	15	157.2	10.5
28-37 high	5	72.6	14.5
38-46 very high	5	83.3	16.7

Discussion

The distribution maps and the discussion of chipped stone tool and ceramic arrangement has presented some interesting points. First, cerain activities are recognizable in the interior of a structure at the Two Deer site. Through preliminary analysis, areas of tool manufacture and/or rejuvenation and food preparation were delineated. Second, the areas are located toward the center of the structure, adjacent to the metates and small fire-hearth. As these features were probably used in both tool making and food processing, they may be referred to as "activity-oriented" features. The metates would have certainly been used in food preparation, primarily the grinding and processing of floral resources. They may have also been used in less expected activities such as crushing bone for

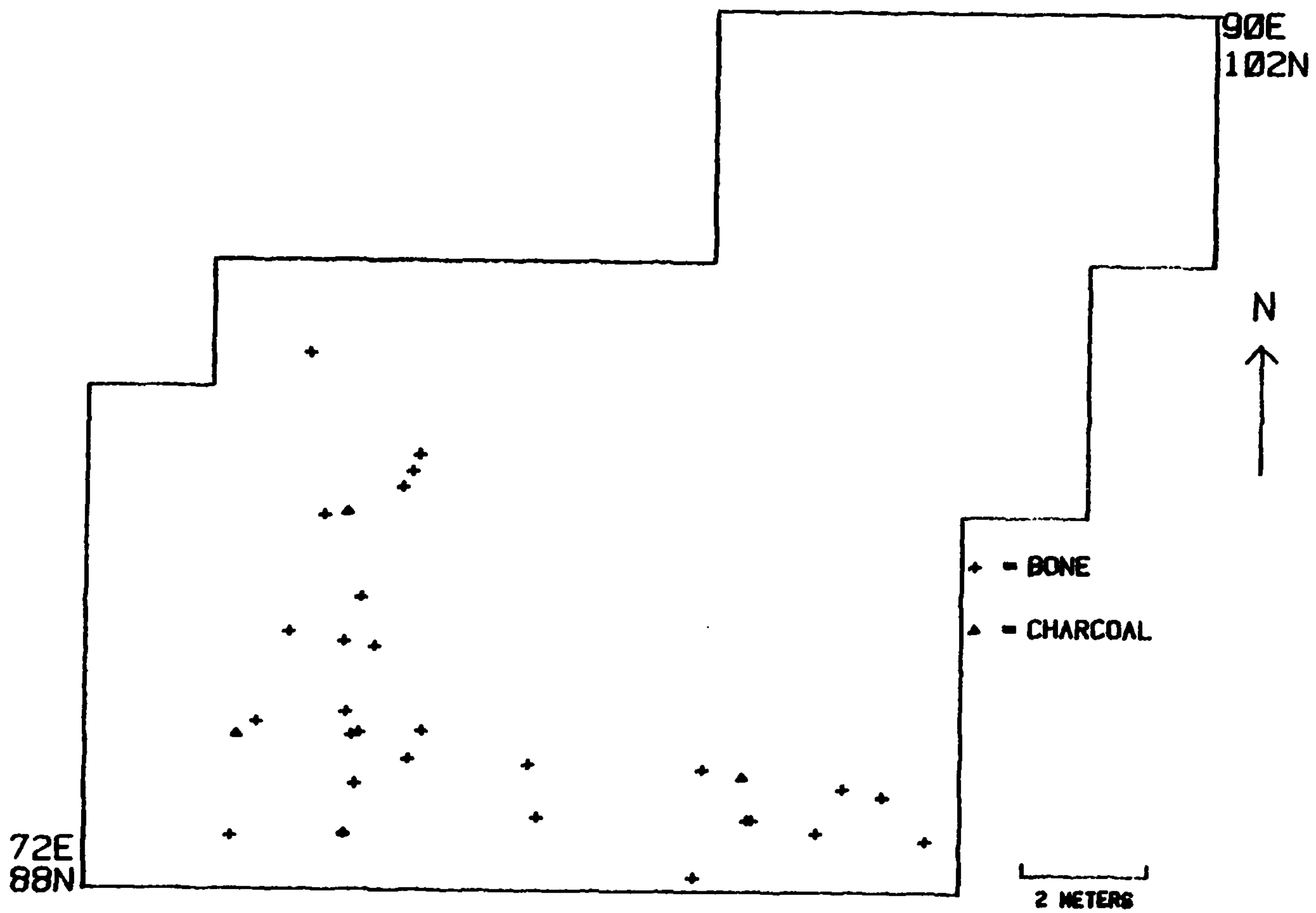

Figure 6.26. Planar distribution of identified bone fragments and large charcoal pieces within the block excavation, Two Deer site.

pottery temper. The small hearth likewise could have served many purposes. Since the base of the hearth, which consisted of mainly ash and burned earth, was all that was found by the 1978 investigations, it is difficult to estimate its original form. While the hearth's small size and absence of hearthstones suggest a rather limited and perhaps infrequent use, it is possible that some form of hanger was placed over the fire which was used to support pots for cooking. This is not entirely speculative as a portion of a charred post was found adjacent to the hearth. This feature could have also been used to thermally alter the chert during tool manufacture. Whatever its uses, neither the hearth nor the metates were moved from their central location in the house during occupation. Main activities such as tool manufacture and food preparation must have, therefore, centered around these central features even if they were not always used directly in the activity.

A third conclusion based on the material culture arrangement adds support to the suggestion that the entryway was located to the northeast. Little material of any type was found in the area. In addition, this is the only area within the estimated limits of the structure that lacks a certain amount of cultural debris. The southwestern and western portions of the structure, while containing a fair amount of material, may have been the living and sleeping quarters in the house. The same arrangement of activities has been suggested for the Budenbender site in northern Kansas (Johnson 1973). While this is a later Upper Republican occupation, a similar arrangement of features, tools, and pottery within a house provide interesting data for a comparison to Two Deer.

The fourth point concluded from the analysis of spatial patterning of material at Two Deer is that activities are not entirely marked by definitive areas. There is considerable overlap between areas where tools were made and where food was prepared. While some isolated activity areas are rather clearly defined, most tend to merge with adjacent areas. There are two possible explanations for this: 1) Repeated use of certain areas by the prehistoric inhabitants led to an accumulation of debris in those areas. As this happened, gaps between activity areas narrowed to where boundaries between the areas became indiscernible. 2) The approximate 1000 years since the time of occupation has certainly caused some displacement of material. While the occupation level at Two Deer is still relatively intact, its shallow nature has allowed for various forms of turbation to act upon the material culture. Actions such as freezing and thawing, farming activities, and rodent burrowing have undoubtedly helped reorient some of the material.

Summary

The Two Deer site, a Plains Woodland-Plains Village occupation located within the boundaries of El Dorado Lake, was the focus of attention by the Museum of Anthropology for three years. Field investigations have uncovered $212m^2$, most of which is confined to a major block excavation. Two houses are evident within this excavation and are characterized as round to oval structures measuring approximately 12 m. in diameter. A series of post mold stains and an accumulation of grass and stick impressed daub attests to the wattle and daub method of manufacture. Interior pits and hearths are small and poorly defined.

Recovered material culture is primarily characteristic of the Plains Woodland period while a few similarities to the later Plains Village tradition are exhibited. These include globular ceramic vessels and small, triangular side-notched and unnotched arrow points. Subsistence was based on the exploitation of locally available fauna such as deer, bison, raccoon, and beaver. Floral resources included a variety of native species plus native (sunflower and marshelder) and tropical (corn and squash) cultigens, marking the earliest evidence for agriculture in the area. The presence of four cultivated plants suggests that agriculture had been practiced prior to the time of occupation at Two Deer.

The quantity and compact nature of cultural material within House 1 at Two Deer provided interesting data for a spatial analysis of the arrangement of this material. A preliminary analysis of the debitage, chipped stone artifacts, sandstone, pottery, and bone fragments distributions suggest areas of tool manufacture and food preparation. These activity areas are located primarily toward the center of the structure, arranged around the two metates and small hearth. The northeast section of the block excavation was suggested to be the location of the entryway to House 1 while the western portions of the house may have been the location of sleeping areas.

Additional analysis of the spatial patterning of the artifact material within House 1 will allow for more refined conclusions on the activities of the prehistoric inhabitants who produced the patterning. Analytical techniques such as: 1) the measure of distance between similar types of artifacts and between artifact densities and the central features; and, 2) an examination of chipped stone tools to delineate their primary function will aid in this refinement.

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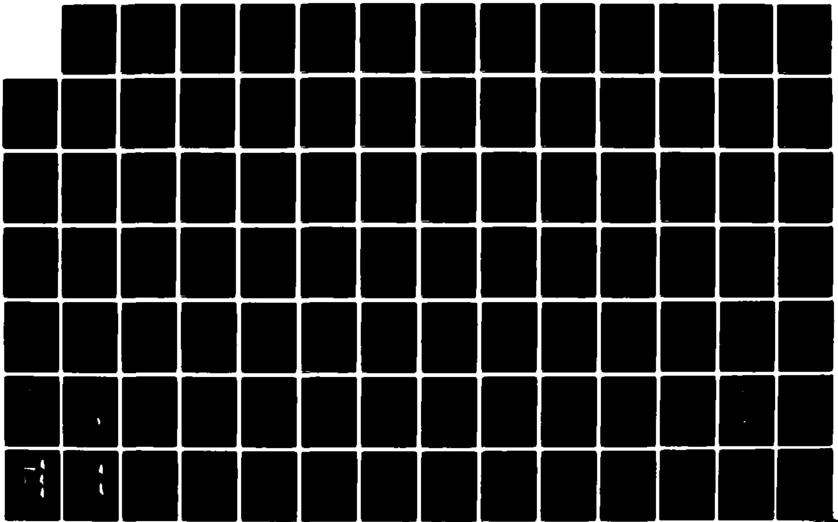

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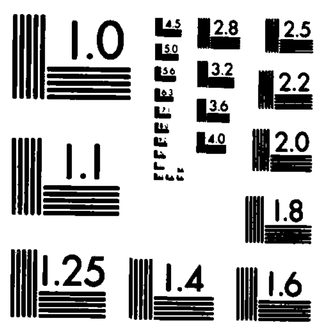

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CHAPTER 7

AN HISTORICAL PERSPECTIVE ON CHELSEA

Floyd R. Thomas, Jr.

The history of Kansas settlement through the 19th century is detailed in the Phase II report for El Dorado (Wilk 1981). Also discussed is a more general history of Butler County, Kansas, and Chelsea, its first town and county seat. This report will focus on the latter, utilizing both primary and secondary sources to reconstruct the town's past and to relate the experience of a pioneer people. Where practicable this account will be told in the often colorful words of the settlers themselves. We can thereby gain a sense of their reality and their sense of humor as well.

At the outset it is important to note that the distinction between a pioneer town and its surrounding countryside is blurred. The two are interrelated; both affect and are affected by the other. Together they formed a community. Not only people who lived within the boundary lines of the town, but also the settlers who actively participated in the town's affairs, considered themselves and were considered members of the community.

It is also important to note that the men and women who settled Chelsea were in many respects like their pioneer predecessors. They too had journeyed west in search of greater opportunity. Many came west to acquire land they could ill afford elsewhere. Some came to open new businesses or to take part in town building and statecraft. Others came to escape a sordid or unhappy past. Still others sought to get rich quick through speculation in the development of a new land. Each came seeking opportunity, but when expectations were unfulfilled or greater opportunities seemed available elsewhere, pioneer settlers proved to be a mobile lot. This is not to suggest that the early settlers were unwilling to struggle to fulfill the promise of opportunity. It does suggest, however, that the people of pioneer America were alert to changing circumstances and willing to pursue alternate paths to achieve their objectives. The history of a pioneer town reflects the image of a people who sought opportunity. The history of Chelsea, Kansas, though, is also a story of a people who faced continued adversity, a factor that played an equally compelling role.

The history of Chelsea, Kansas, like any history, must begin at a point arbitrary in time, for each moment is preceded and affected by another. Because the Phase II report provides the necessary background details, this account begins in August of 1857 in Emporia, Kansas. There a group of settlers gathered to ready their assault on the untamed land they would make their home. Of the group, Martin Vaught, J. C. Lambdin and his son, Ralph, and the George T. Donaldson family were the first to arrive. Donaldson was not new to Kansas. In 1854 he and his wife had settled in Jefferson County. While there he had taken an active part in the fight against the admission of Kansas to the Union as a slave state. As captain of a Free State Company, Donaldson provoked pro-slavery sympathizers who offered a $500 reward for his capture "dead or alive" (Walnut Valley Times, Aug. 31, 1883). Fearing for his life and the safety of his family, Donaldson began his search for a safe haven on the frontier.

Vaught, the Lambdins, and Donaldsons were soon joined by a number of settlers who also intended to stake claims on the recently opened government lands. Among them were two individuals who were to profoundly affect Chelsea's future. One was Prince Gorum Davis Morton, who having a wooden limb was dubbed "Peg-leg." Unlike Morton, the second individual was to be with the new settlers for only a short time, but his impact was no less significant. Both the man and his significance have been described in the historical recollections of Martin Vaught:

> There came to our camp, too, with a long, swinging stride, a long rifle on his shoulders, a large pack on his back, carrying his boots while his feet were unshod, his hat rimless and clothing in tatters, a man who had been on an extended tramp. His hair was light, his eyes blue and bright and contrasted strikingly with his sun-tanned skin. His name was I. N. Barton, a college professor and civil engineer from Maine. He had come to Kansas for health and he had found it, having explored every stream south of the Neosho and as far west as Cow Creek--west of Wichita. His description of the Walnut and Whitewater Valleys and his prediction that in and near them was the Garden Spot of Kansas won us and we unanimously agreed to go with him and see them (Walnut Valley Times, March 8, 1895).

The company followed Barton along the Emporia Trail and made camp near the confluence of Cole and DeRacken Creeks, which they named after two of the families in the gathering. "Surprised and pleased" with the "beautiful expanse" of their new domain, the settlers proceeded to stake their claims (Walnut Valley Times, March 8, 1895). Well suited to corn farming, the fertile river bottoms were quickly claimed by the new arrivals, who, with one exception, had come from the corn producing states of the Middle West. Data compiled in the 1865 census indicates that the settlers claimed an average of 160 acres, the maximum allowed under the Pre-emption Act. Settlers were permitted to purchase up to 160 acres at $1.50 per acre by provisions of the act.

Having staked their claims, the settlers began to build log cabin shelters "with a will" (Vaught, Times, March 8, 1895). The structures were, "necessarily, rough affairs," heated by fireplaces constructed with mud and sticks (Gordon, unpublished). An early Chelsea area settler, Sarah Elizabeth Gordon, recalled that for many weeks the doors and windows of her family's cabin were closed with blankets and pieces of carpet. "While these temporary doors and windows served very well to keep out the flies and mosquitoes we were somewhat shaky at night when the wolves came close to the house as they often did" (Gordon, unpublished).

Wolves and a variety of other wild animals roamed the area at the time. Deer, wild turkey, and buffalo were hunted by the pioneer settlers. A powder horn made by a member of the Lambdin family from the horn of a buffalo killed in 1862 is preserved in the collections of the Kansas State Historical Society Museum.

Once they had staked their claims and constructed shelters, the original settlers and the dozen or so who had followed that winter, turned their attentions to community development. Less than six months after the initial settlement, plans were well underway for the establishment of a new town. This endeavor was considered an important link to the area's prosperity and well being, for a town would provide both a market for crops and a refuge against the relative isolation of a frontier existence. It was thought that a town could stimulate further settlement and thereby increase the value of the land. The entire community would benefit from the development of commercial business and social services accompanying the town's growth. An influx of new residents would decrease the individual's tax burden while increasing the community's ability to meet the educational needs of its children. The settlers may also have considered a town the essential ingredient in any future attempt to acquire railroad service, for "it would be the town that would raise the bonds necessary to attract a rail line to the area" (Wilk 1981). A rail line was desired not only for the expansion in farm markets it would provide, but also for the improvement in transportation that would enable more manufactured products and people to make their way to the frontier community.

In 1857, however, the settlers were probably less concerned about taxes and prospects for a railroad line than they were about the more immediate tasks of selecting a town site and giving it a name. The lone easterner in the group, P. G. D. Morton, figured prominantly in the resolution of both concerns. Martin Vaught has provided both a description of the man and an insight into the selection of the new town's name:

> "Peg-Leg" Morton was from Boston, which to him was the hub of the solar and all other systems. He was a good singer and enlivened our camp with songs whenever not engaged in relating his adventures, the like of which never were on land or sea. He had sung to the elite of earth, even to the crowned heads of Europe as far back as Mary, Queen of Scots. We kept tab on him and figured up by his romancing that he was not under four hundred years old; he only claimed to be thirty-five. Morton named Chelsea. He wanted to call it Boston or New Boston, because he was from Boston. We compromised on Chelsea, which was a town near Boston and Chelsea it is even to this day (Vaught, Walnut Valley Times, March 8, 1895).

Whether by the force of his personality or the fact that much of the town was to be plotted on land he claimed, Morton convinced his fellow settlers to name the town after a city near his former Massachusetts home.

Having selected a name, the settlers formed the Chelsea Town Company, which was incorporated on the approval of the acting governor of Kansas Territory, J. S. Denver, on February 11th, 1858 (Kansas Private Laws, 1858, p. 323). Composed of N. S. Storrs, J. C. Lambdin, P. G. D. Morton, William Woodruff, L. M. Pratt and G. T. Donaldson, "their associates and successors," the town company was declared "competent to make contracts, sue and be sued, plead and be impleaded in all matters and in all courts." The company was further empowered "to make such by-laws as may be deemed necessary for the government of said company, for the management of its

affairs, and for the transfer of its stock by each individual stockholder" (Laws, 1858, p. 323).

The new corporation was given authority to purchase up to 320 acres of land in Butler County, Kansas Territory, and to "lay off the same into blocks, lots and squares, and to sell, and dispose of, and convey the same by deed" (Laws, 1858, p. 323). Shortly thereafter, "the first plat was made by a company" on land between the Emporia Trail and Durechen Creek (Vaught, Walnut Valley Times, March 8, 1895, p. 4).

To date, unfortunately, neither the town's by-laws nor its original townsite have been discovered. Consequently, the legal records on file in the Butler County Courthouse fail to provide a clue to the town's physical appearance during the first decade of its existence, or even such basic information as the townsite's precise location. However, correspondence from P. G. D. Morton to the governor of Kansas Territory in 1858 does provide a legal description of the 320 acres the town company designated as Chelsea (Correspondence to Governor from P. G. D. Morton, 1858, Acc. No. 240, Kansas State Historical Society). The townsite accordingly straddles four sections, taking a quarter section from each as illustrated in Figure 7.1.

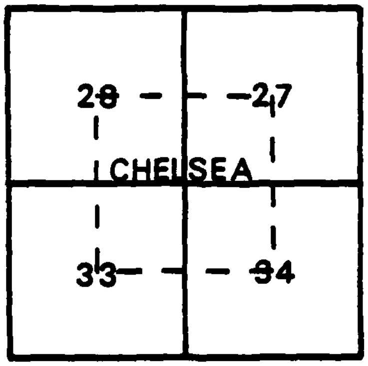

Figure 7.1. Chelsea as delimited by legal description.

Although the legal description significantly diminishes the area of investigation, 640 acres represents a substantial area for archaeological work when conducted under time constraints. To pinpoint more precisely the townsite a variety of commercially produced maps were examined, with the result that Chelsea was shown to appear in numerous locations simultaneously (Fig. 7.2). Commercial maps of this date, then, are obviously of questionable value in determining the exact location of Chelsea or other pioneer towns of the period.

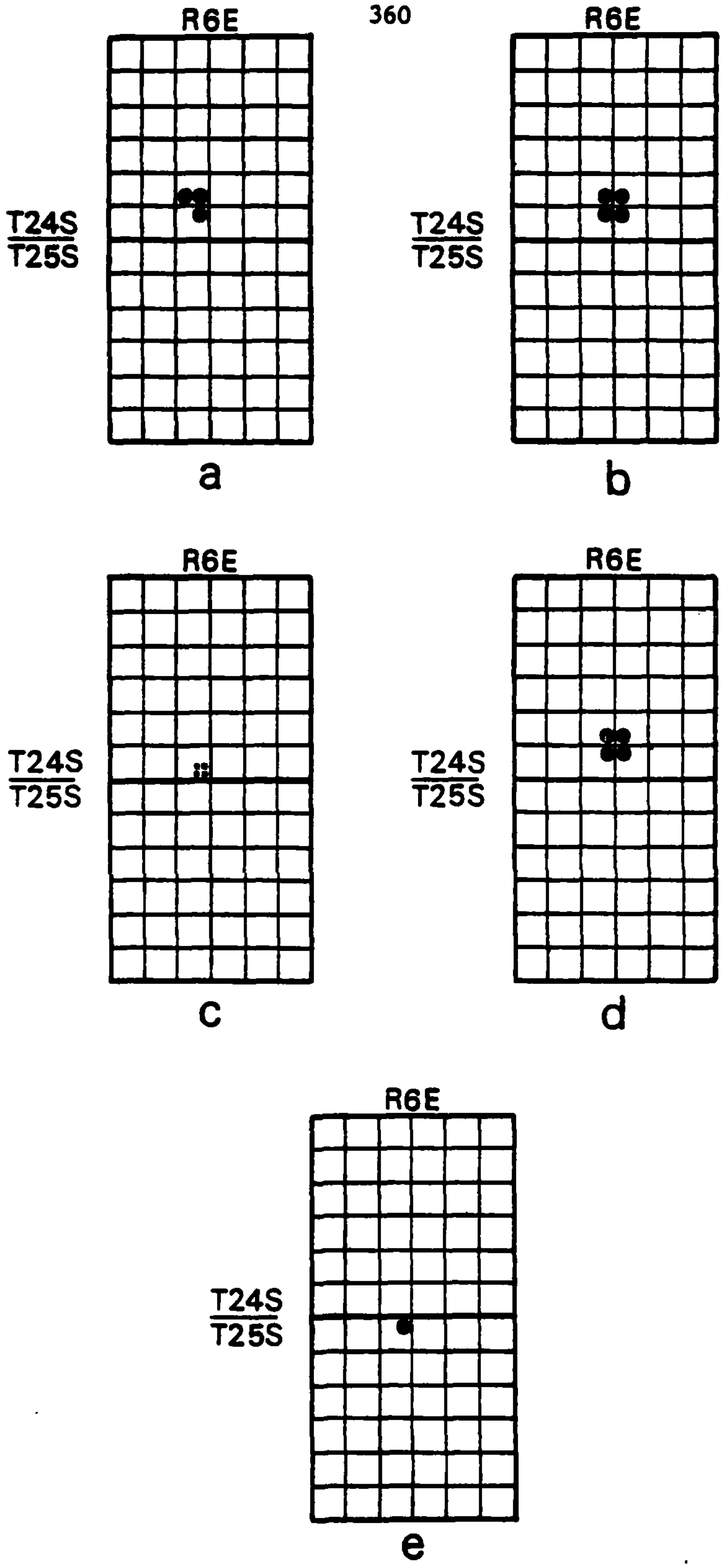

Figure 7.2. Examples of Chelsea's location as depicted on maps: (a) Stevenson & Morris, New Sectional Map of Kansas, 1859; (b) Gunn's New Map of Kansas, 1859; (c) Mitchell's Sectional Map of Kansas, 1859; (d) Gunn & Mitchell's New Map of Kansas, 1861; (e) Colton's New Sectional Map of the State of Kansas, 1868.

Far greater success in pinpointing Chelsea's location was obtained by consulting government road maps. Two such maps were found, one in the office of the Butler County Engineer and the other in the collections of the Kansas State Historical Society in Topeka, Kansas. Both plotted the town's location within the legal description, but narrowed the field of investigation as shown in Figure 7.3.

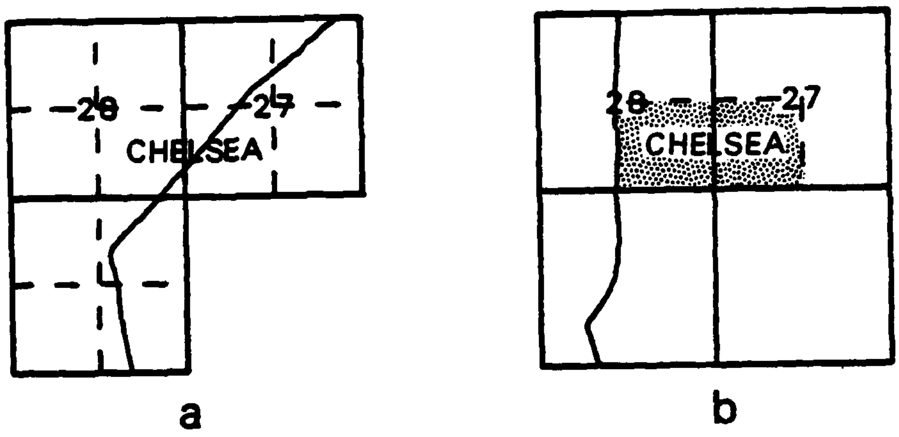

Figure 7.3. Roads in the vicinity of Chelsea:
(a) plat of the Emporia and El Dorado Road, June 4, 1861;
(b) plat of a road running from El Dorado by Chelsea and Cedar Point to Junction City.
The first map is from the collection of the Kansas State Historical Society, the second can be found in Road Book A, Butler County Courthouse, Butler County, Kansas.

The evidence provided by the two road maps is in part corroborated by the single recorded deed transaction involving Chelsea town lots within the legal description indicated in P. G. D. Morton's letter to the Kansas territorial governor. Recorded August 27, 1860, the deed reports the $50 purchase of a house, 13x16 feet, and three lots, two on which the house stood, and the third being "some one of the business lots as plotted on town plot of the Chelsea Townsite" (Deed Book A, No. 1, Butler County Courthouse). The legal description of the property sold in this transaction places the lots in the western half of the townsite recorded on the state road maps.

Lending further support to the authenticity of the site as recorded on the road maps are features that correspond to topographic and geologic descriptions of the site. According to a variety of sources Chelsea was situated "on a high hill . . . commanding a view for miles around" (Walnut Valley Times, Oct. 22, 1873). Such a view was desired by settlers fearful of vulnerability to an Indian attack. That the position afforded the settlers a beautifully scenic panorama of the countryside was probably a secondary consideration at the time. The hilltop location was also valued for enhancing the town's visibility to prospective settlers.

Chelsea's location was also reported to be in close proximity to an ample supply of both water and timber, a factor of undoubted importance in the selection of the townsite. The Walnut River provided the former, and the forested areas along its banks provided the latter. Timber was invaluable to the settlers as both fuel and primary building material. In addition to water and wood, the Chelsea site offered another highly valued resource. The Emporia News reported the presence of "an excellent and very beautiful stone, found in large quantities upon the townsite of Chelsea" (Oct. 15, 1859). According to the report, "Chelsea Stone" was soft enough to cut with a saw when quarried, but with exposure to air, became as hard as ordinary limestone. The stone was described as pure white in color when dry, very handsome in a wall, and "almost equal to marble." Such features made this resource a valuable construction material.

The site designated by the government road maps not only has the highest elevation of any land in the area, but also the remains of a limestone quarry, and thus meets the legal and physical description of the Chelsea site. By tracing the ownership of this land it was hoped that information might be obtained concerning the physical layout of the town into blocks and lots. As previously noted, however, the records were lacking in this regard. Not even the one deed on record, already mentioned, was included in the abstract of title. This may have several plausible explanations. It is possible that commitments made to the town company in exchange for town lots were not fulfilled, nullifying transactions intended to result in the transfer of titles. It is also possible that transactions prior to the transfer of government title were not formally recorded. Title on the town site land was not granted until 1860, at which time J. C. Lambdin acquired the eastern half and P. G. D. Morton the western half of the site. That the land was titled to these men lends credence to Vol P. Mooney's claim that Lambdin plotted the town site (Mooney 1916). Martin Vaught, though, as previously cited, indicated that the first town plat was made by "a company" in 1858.

Settlement of the Chelsea countryside was very rapid; by the fall of 1858 "there was not a claim on the upper Walnut or any of its tributaries with timber on it which was not taken" (William Harrison, Walnut Valley Times, June 16, 1876). Harrison, an early settler in the community, speculated that there were more people in Butler County in 1858 than at any time before the close of the Civil War. The claims were not all held by the popularized version of a "typical" pioneer family, however. "There were many women and children among us," Harrison recalled, "but many of the best claims were taken by young women who were only carpet bag settlers, and held the land only for speculation." Speculators notwithstanding, the community became large enough for C. S. Lambdin to open a Chelsea post office at his home in 1858. Prior to that time, Chelsea's most accessible post office was in Lawrence. According to Martin Vaught, "A tri-weekly hack was running from Lawrence to Emporia and Chelsea and Emporia rented 'Box 400' at Lawrence to which their mail was addressed. Whoever of us went to Emporia brought down the mail for Chelsea" (Vaught, Walnut Valley Times, March 8, 1895, p. 4).

As might be expected, Chelsea area settlers experienced a variety of difficulties on their newly settled lands. Because time had been spent selecting claims, building shelters, and breaking the sod, crop production

was meager in 1858. Many of the settlers were too poor to purchase food in Emporia or Lawrence and were consequently forced to leave their claims over the cold winter months. Many hoped to return with the warmth of spring. Less concerned about a lack of food than they were distressed about the potential for trouble with the Indians, some settlers deserted the area and sold their claims "for little or nothing" (Harrison, Walnut Valley Times, June 16, 1876).

By the spring of 1859, however, most of the best claims were once again occupied, and much of the land previously broken was cultivated. A reporter for the Emporia News offered the following description of the area and an optimistic assessment of its future:

> Butler County comprises a large area of fertile land, well watered and timbered; (it) is without doubt one of the most healthy regions of Kansas, and is destined to be one of the wealthiest counties of the southwest. Chelsea is the county seat, and will, under proper management, make a good town. The Town Company is offering good inducements to persons who will construct permanent improvements on the town site (Aug. 13, 1859).

Signs of Chelsea's development included the opening of Mr. Kaufman's county store. C. S. Lambdin, J. C. Lambdin's cousin, built a saw and grist mill with machinery hauled from Leroy (Times, March 8, 1895). Although the first steps toward the establishment of municipal and county organization had begun in 1858, the first meeting of the Board of County Commissioners was not held until April 30th, 1859. N. S. Storrs had previously convened a meeting of area residents to discuss the organization of Butler County. Little was accomplished, however, for "Owing to the prevailing sickness of the people . . . but few were in attendance" (The (Emporia) Kansas News, Sept. 11, 1858). At an organizational meeting in 1859, held at the home of G. T. Donaldson, substantially more was accomplished. J. R. Lambdin was selected county clerk; C. S. Lambin, county treasurer; J. C. Lambdin, probate judge; Doc Lewellyn, sheriff; and G. T. Donaldson, Dr. P. G. Barrett and Jacob Landis, county commissioners. Being the only town, "Chelsea was named as the county seat of Butler County by consent of the settlers" (Butler County Commission, 1878). The county commissioners were therefore ordered to hold their meetings at Chelsea. J. C. Lambdin's home, Chelsea Hall, was subsequently selected as the site for Butler County Commission meetings. At a special meeting of the commission on June 13, 1859, P. G. D. Morton was appointed both assessor of Chelsea township and county auditor.

In 1859 a "fair crop" was harvested in the Chelsea countryside, but renewed uneasiness about Indian hostility tempered the settlers' sense of security.

> County settlers, being on the frontier, viewed their situation as critical; surrounded by Indians on the east, south, and west sides; removed from any large towns; and too sparsely populated to defend themselves (Wilk 1981).

Chelsea residents were so concerned about Indian hostilities, William Harrison explained, because "The Osages were very saucy and made some threats and stole many horses" (Walnut Valley Times, June 16, 1876). Consequently, "The more timid of our settlers were constantly leaving which had a tendency to discourage others who wished to stay. Some were coming, many were leaving." That those who remained were in constant fear was aptly illustrated by an incident known as the "Chelsea War."

The event which precipitated the "Chelsea War" was an Osage Indian's warning that several thousand Comanches were on the warpath and that they would be in the Chelsea area the next day. The buffalo hunters who were warned alarmed the settlers of the Whitewater and lower Walnut River Valleys, and as Martin Vaught recalled,

> There was a great stampede to Chelsea. One of the hunters, Jerry Woodruff, mounted a pony at Towanda Springs and with a butcher knife for a spur made the trip to Chelsea in quick time, feeling for his scalp at every jump and warning everybody he saw. The settlers barricaded the C. S. Lambdin (log) house that stood on the then townsite . . .
>
> Some of the settlers declared that as they came they saw houses burning on the Whitewater. Wagons were formed into corrals, stock inside. Water was provided in the house and every preparation made to stand off the Noble Red Man. Pickets were posted by Capt. George T. Donaldson who commanded, among them "Peg-leg" Morton. Toward morning when Indians usually make attacks, he heard the whizz of arrows coming from the river. In a panic he fired his gun and broke from the house yelling "Indians! Indians! The Indians have come!" Consternation reigned; children cried; mothers prayed; men swore and prepared to sell their lives dearly. The Redskins did not advance at once and cool men said, "we'll reconnoiter." They advanced with Morton to his picket post when whizz! whizz! went the arrows. "That's them," shouted Morton. "They're shooting at us." And the sounds were nothing more or less than goshawks gathering their food as they flew. "Peg-leg" never heard the last of this scare (Walnut Valley Times, March 8, 1895).

The immediate threat has proven unfounded, but the settlers remained fearful that Indians might arrive at any moment. While the settlers braced for battle, word was sent to Emporia of an impending Indian attack. The citizens of that town responded by sending P. B. Plumb and their "fiery sons of Mars" to Chelsea's relief (Harrison, Walnut Valley Times, June 16, 1876). The Emporians were evidently well received, for William Harrison recalled, "Although we had not seen an Indian we were intoxicated with joy when our Emporia friends rode into our camp." The settlers remained encamped at Chelsea for about three days before concluding that the Indian scare was a false alarm. G. T. Donaldson vowed that he would never again run until after a fight (Harrison, Walnut Valley Times, June 16, 1876). Many of his fellow settlers, however, were not so bold.

Chelsea's "War" with the Comanches was a phantom confrontation, but the fear instilled in many of the settlers did not subside, and the area's population began a precipitous decline. As William Harrison noted, "Some who had but little hold on the country, or the country had but little upon them left, many of whom never returned" (Walnut Valley Times, June 16, 1876).

One settler had another reason for leaving Chelsea -- dissension within the ranks of the town company. A rift between two of Chelsea's founding fathers culminated in a confrontation at the 13th District Nominating Convention which was charged with the selection of candidates for the territorial legislature. According to N. S. Storrs, Chelsea's delegate to the convention, P. G. D. Morton was "over anxious to receive the nomination of Representative" (Emporia News, Nov. 5, 1859). Knowing that Storrs would not vote for him, Morton questioned the delegate's citizenship. "Not knowing the first rudiment of the authority vested in him," Storrs blasted, the convention chairman entertained the question, despite the fact that Morton "had no right to interfere with the proceedings." Explaining his adversary's tactics, Storrs complained, "Morton harrangued the Convention with his usual blarney until it became tiresome."

The Emporia News covered the dispute in its columns and supported Storrs' argument, but the convention delegates awarded Morton the coveted nomination. A month later Morton was elected the district's first Representative in the territorial legislature, having garnered 23 votes. Perhaps embittered by Morton's victory, Storrs moved to Emporia where he had cause to believe his talents were more highly valued. That Chelsea lost a productive citizen is evident in the success Storrs enjoyed as proprietor of the Emporia House hotel. On his acquisition of the business, the Emporia News announced that Storrs would "henceforth manage that hotel in his own superior style" (February 11, 1860). Perhaps two strong-willed individuals like Morton and Storrs were too much for one small town.

But Storrs was not the only Chelsea resident to leave the area for reasons other than fear of Indian attack. In May, 1859, a company of men from Chelsea outfitted by Emporia merchants headed for the mines of the Pike's Peak region. When they departed for their journey Chelsea could provide neither the provisions they needed nor the prospects of instantaneous wealth that lured them from their newly established homes to the mines of Colorado. But the would-be miners from Chelsea were not drifters ever anxious to move on. C. S. Lambdin, Ralph Lambdin, F. Gordy, B. McCleary and C. M. Bell were considered "energetic, reliable men," whom, the Emporia News wrote, "we regret to lose from the country" (May 12, 1860). As proprietor of the Chelsea Mill, C. S. Lambdin was expected to return in the fall, so the Emporia paper secured his promise to report "his views of the present condition and future prospects of affairs at Pike's Peak."

Although a basic tenant of booster philosophy mandates praise of one's territory above all others, Lambdin's reports suggest that he was not so enamored of Chelsea that he could not see beauty elsewhere. Of the group's journey to Colorado Lambdin wrote, "a more beautiful country than that lying along these streams, I never saw" (June 2, 1860). However, this minor breach in boosterian principles by one Lambdin was offset by the booster spirit exemplified by another. M. C. Lambdin responded angrily to negative comments about Chelsea made in the Americus Sentinel, a rival town's

newspaper. In a letter to the Emporia News Lambdin refuted derogatory statements made by disenchanted former residents who had relocated in Americus. The former residents claimed that famine and sickness prevailed to such an extent on the Walnut as to defeat the settlers most persevering efforts (June 9, 1860). Further, according to the Americus boosters, the Walnut had proven a great delusion to the settlers.

Responding, Lambdin declared, "I need not tell you, Mr. Editor, that these statements are slanderously false; but there may be persons who will be influenced by them" (Emporia News, June 16, 1860). Lambdin and others in Chelsea were undoubtedly more concerned about the ramifications of bad publicity than they were about a few defections to Americus, for newspapers were sent east not only to report news of the day, but also to attract settlers. Conversely, negative reports made in the rival town's newspaper could damage Chelsea's future prospects.

Lambdin countered the Americus charges by claiming that the health of the Chelsea area compared favorably to any section of Kansas and that crops had been "invariably good." That prospects for the future could not be better was demonstrated, Lambdin suggested, by "the fact that we are gaining TEN permanent settlers where we are losing one." Having chastized the Sentinel and its errant informants, Lambdin concluded:

> Let no one be mislead by these false statements. The Walnut offers superior inducements to settlers, and will grow grain enough the present season to support not only the numbers now here, but hundreds of others, whom we hope to welcome among us next year.

But the next year failed to live up to M. C. Lambdin's advance billing, and many residents may well have agreed that the bright prospects for the area had proven a delusion. By August, 1860, only a small number of Chelseaites could afford to pre-empt their claims. Judge Lambdin, G. T. Donaldson, P. G. D. Morton and several other settlers made the trek to Fort Scott, Kansas to purchase title to their properties, but as the Emporia News reported, "The number of settlers in Butler County who will be able to pre-empt their claims, will be few--not over one-half the whole number" (Aug. 4, 1860).

The year 1860 proved discouraging in many respects. Not only were many settlers unable to pre-empt their claims, but other calamities plagued the Chelsea community as well. In August the Emporia News reported that "two Mulatto brothers named Gaskins" had suffered the loss of five horses through theft. The thieves also absconded with two horses owned by white settlers. It is doubtful, therefore, that the theft was racially motivated. Whatever the motivation, horse theft was considered a very serious crime. When confronted with the theft of their horses, settlers were neither complacent nor content to stand idly by, but responded quickly on their own initiative. When the DeRacken family was implicated in a horse stealing operation

they were forced to flee for their lives. The incident was recalled by Martin Vaught as follows:

> Many horses had mysteriously disappeared and were traced very close to DeRacken's and Bob was suspected. A vigilantes committee called upon him but he was discretely absent. His younger brother was caught and ordered to tell where Bob was. He refused, a rope was brought and he was hanged by the neck repeatedly, but he was steadfast and said they might take his life but they couldn't make him tell and they didn't. The DeRacken's however, "made themselves scarce" (Walnut Valley Times, Mar. 8, 1895).

Following their departure the spelling of the stream earlier named in their honor was modified, and is to this day known as Durachen Creek.

The absence of law enforcement officers in the area necessitated a response from the settlers themselves. When the DeRacken family was found to be involved in horse theft the community acted. The Gaskins brothers were also quick to respond to their loss. "As soon as (a) trace was discovered, pursuit was immediately made by the Gaskins brothers" (Emporia News, Aug. 25, 1860). The result of their search is unknown.

Other calamities were more widespread in their affect on the pioneer settlers of Southeast Kansas. In the fall of 1860 a cattle disease struck herds around Emporia, and it is possible that stock owned by Chelsea residents were also affected. The price of beef almost certainly was affected by the disease which was correctly attributed to the droves of Texas cattle passing through the area (Emporia News, Sep. 1, 1860).

It was another disaster, however, that proved most devastating to Chelsea settlers in 1860. Drought played havoc in Otoe, Hunter, and Butler counties. Each had only recently been populated so the number of acres planted was insufficient to compensate for any loss. Likewise, area residents had a very limited opportunity to stockpile the harvests or proceeds from previous growing seasons to provide for the proverbial "rainy day." Actually it was the lack of a rainy day which proved so destructive. A "good rain" had fallen on the night of August 20th, 1859, but "No other rain fell for about eighteen months, except a few light showers which scarcely laid the dust" (Harrison, Walnut Valley Times, July 7, 1876). Recalling 1860, Martin Vaught wrote,

> It was a year of unprecedented drouth. May, June, and July without a drop of rain. Every green thing withered; even the leaves of the trees turned yellow and then brown. The streams dried up, fish innumerable died and as the deep water holes dried away, they were pitched into wagons and hauled to hogs. Great seams cracked in the

> earth. It was really dangerous to ride a pony at speed through the prairie. To add to our woes along in August came myriads of grasshoppers that literally hid the sun....This awful year gave Kansas a name that was a detriment to her for years afterward (Walnut Valley Times, March 8, 1895, p.4).

William Harrison recalled that "Many of the people were much alarmed, for fear of starvation, and in the fall of '60 the roads were lined with wagons on the 'back track'" (Walnut Valley Times, July 7, 1876). The Leavenworth Daily Times accurately predicted that the area's settlers would be "obliged to look elsewhere for means of subsistance until next harvest" (Sep. 22, 1860).

Chelsea area residents were indeed required to look elsewhere for means of subsistence. Settlers of the Walnut River area were obliged to receive relief goods that winter and the following spring. Martin Vaught briefly outlined the relief procedure:

> Agents went to the states and solicited relief, which was most generously granted. S. C. Pomery, afterwards United States senator, was relief agent at Atchison and all supplies were shipped through him. Human hogs came to the front as usual on such occasions but generally relief was fairly distributed. Grain, flour and beans were shipped in heavy grain bags, which were afterwards utilized for clothing on which the lettering would show. Some times it would be "S. C. Pomeroy" on one leg, "Kansas Relief" on the other, and "Atchison" somewhere else. A pair of pants worn by a Mr. Bixler took the cake. He was both broad and tall and on the broadest part of his pants in black letters was "Kansas Relief, S. C. Pomeroy, Atchison, Kansas" (Times, Mar. 8, 1895).

Many settlers were dependent on the good will and assistance provided from fellow Kansans and from friends and families east of the Kansas Territory. Of the 1860 drought one Chelsea settler wrote that "almost the whole territory must have been depopulated, if friends in states east of us had not sent supplies which enabled us to 'hold the fort!'" (Harrison, Walnut Valley Times, June 16, 1876).

Of the many setbacks Chelsea suffered in 1860, of most enduring significance was an event that may have seemed of little import at the time. Butler County's boundary lines were changed to include El Dorado, a town that would soon challenge Chelsea for dominance in Butler County.

Despite the series of disasters that befell Chelsea's citizens in 1860, new hope for prosperity arrived with the spring of 1861. In March one settler was pleased to note that the grass was again "sufficiently tall to afford good picking for stock of all kinds" (The Emporia News, March 9, 1861). But the hope in evidence in March gave way to a sense of hopelessness in June. A threat quite apart from the inexplicable forces of nature compelled many families to leave the Walnut country. It was not the destruction of crops by another grasshopper

invasion, but again the fear of Indian hostilities which stimulated an exodus. An "intelligent gentleman" from the Chelsea area complained to an Emporia News reporter that there was "no protection there for life or property, should the Indians take a notion to pay them a hostile visit" (June 22, 1861).

The Indians might well have made a similar claim, for as the Emporia News observed,

> If the people of that section of country could rid themselves of a few bad characters, who engage in stealing ponies from the Indians and otherwise molesting them, we do not believe the peaceable whites would be disturbed" (June 22, 1861).

Evidently the Indians exercised greater restraint than certain Chelsea area residents.

While 1860 was particularly devastating to the Chelsea community, 1861 was not without its special adversities. That year fire plagued the settlers. Chelsea House, J. C. Lambdin's home and the seat of Butler County government, was destroyed by a blaze on the 11th of March, 1861. P. G. D. Morton's account of the fire, reported in the Emporia News, provides a description of the residence as well as a report of the conflagration:

> The fire was communicated to a corn crib standing near the house, from the coals of an ash bucket, and from thence to the kitchen which was a few feet removed from the main building. As soon as the fire caught in the kitchen, the family commenced moving the things from the main building, and succeeded in getting out most of the clothing and bedding, and a portion of the furniture, before they were arrested by the flames. The corn crib, kitchen and main building were all destroyed, together with all the cooking utensils, and kitchen furniture, and bedsteads (March 23, 1861).

It may be that a storage shed had been attached to one of the destroyed structures, for among the items lost in the fire were listed a buggy, harness, and saddle owned by P. G. D. Morton. Lambdin's financial loss was estimated at not less than one thousand dollars. Even for a highly successful farmer who had been elected to the upper house of the Territorial Council in 1859, the loss was substantial. But Lambdin was not alone in his loss by fire. Less than a week after the destruction of Chelsea Hall, the Chelsea schoolhouse was burned to the ground. Constructed in 1860, largely through the determined efforts of G. T. Donaldson, the school was the first built in Butler County (Walnut Valley Times, July 21, 1876). The building had been used for Sunday school in the morning, and it was thought that the fire was carelessly left when the school dispersed (The Emporia News, Mar. 23, 1861).

In less than one week in 1861, two major Chelsea landmarks had

been destroyed by fire. A fire of a different sort threatened to destroy the Union. The Civil War ignited a period of destruction unparalleled in the nation's history, and Chelsea was not spared its impact.

To defend against hostile Indians, "border ruffians" and Confederate troops, Chelsea's men organized a company of home guards with P. G. D. Morton as Captain and James Craft as Lieutenant. According to one volunteer, "We had no authority from anyone to act but were subsequently organized and paid by the state" (Jeremiah D. Conner, Walnut Valley Times, Mar. 19, 1897). Under Morton's direction a fortification was constructed. Located within a horseshoe shaped meander of the Walnut River, the installation became known as "Fort Bend" (14BU1009). An article published in the Walnut Valley Times offered the following description of the site:

> Thirty years ago the outline of breastworks was plainly visible and consisted of a deep trench cut from bank to bank across the narrow strip of land; back of this trench and protected by it in front and by the river on each side in the rear was located the fort which was constructed of heavy logs (Mar. 26, 1906).

While headquartered at the fort, the militiamen camped under the shelter of government issue tents and awaited the fray. But no major battles were to be fought in the Chelsea area. As one of the men later wrote, "The only speck of war that occurred on Butler County soil was the capture of a wagon train on the head of Hickory Creek in Hickory Township October, '61" (Conner, Walnut Valley Times, Mar. 19, 1897). In an article on Butler County Civil War history, J. D. Conner recounted the "secession train" incident:

> The train was the private enterprise of a firm at Leavenworth, Majors & Russell, an old freighting firm, from where government supplies and stores had been conveyed and delivered to still further western forts. The employees were largely if not entirely southern and of southern sentiment, and as sailors mutiny and take charge of a vessel, so they "gobbled" this train and were taking it south as their booty, a proceeding that had become common and the government had ordered it stopped. The train was on the old southern branch Santa Fe (California) trail which crossed the Whitewater on Amos Adams' farm....We had word of their coming our way. Capt. Morton was in command. A number of men under Capt. Bemis came over from Eureka to help us. We had perhaps fifty men all told. Taking in about the same number of freebooters was an easy and bloodless victory (Mar. 19, 1897).

But the operation was not without its minor complications. "In

the blackness of the night" two of the prisoners escaped and it was feared they would return with a Confederate force. Acting on this fear, a messenger was sent to the Governor requesting help "to sustain the settlers in their position" (Kansas State Journal, Oct. 17, 1861). The "secession train" and prisoners were then taken to the log fort and held for two or three weeks until remanded to the custody of Major Cloud.

The prisoners, who maintained they were Union men whose property had been "Jayhawked," apparently welcomed the transfer from Morton's command. In a "card" placed in the Emporia News, "the owners and parties interested in the train traveling en route for the Cherokee Nation from Colorado Territory," offered their most sincere thanks" to Major Cloud and the people of Emporia "for the kind and gentlemanly manner in which they have treated us, since rescued...from the hands of Captain Morton and his band of Jayhawkers" (Oct. 24, 1861). The prisoners were ultimately taken to Fort Leavenworth for their claims and the charges against them to be properly investigated. So the prisoners had come full circle, from Leavenworth and back again.

Morton's capture of the secession train created considerable public excitement. The incident was reported in newspapers across the state. Although the accounts varied somewhat it was generally agreed that the train constituted quite a prize; approximately 21 ox-drawn wagons, two loaded with goods, 425 head of cattle, 25 ponies, several revolvers and rifles, and 35 prisoners were taken. A Topeka paper, the Kansas State Journal, proclaimed the capture

A Rich Haul!
Capt. P. G. D. Morton On The Alert!
He Captures a Large Secession Train!

While Morton won acclaim for his capture of the train, he also acquired provisions from General Hunter to sustain the vigilante "Chelsea Militia." A train of seven government wagons "loaded with flour, bacon, etc." arrived in Emporia on December 6th, 1861, en route to Captain Morton's Chelsea troops at their log fort headquarters. But the fort and the Chelsea militia were both short lived. By one account, the company broke up the following Spring when "the majority" of its volunteers joined the U. S. forces mustered at Leavenworth (Andreas 1883:1431). One volunteer explained, however, that the militia disbanded "when tiring of camp life on the Walnut, 26 of us, with Mathew Cowley at the head, went to Iola and enlisted, making up Company L, 9th Kansas Cavalry" (Stratford 1934:58).

The feared hostilities had not materialized so life on the Walnut might well have been "tiring." The monotony of the vigil was broken only briefly when the "secession train" prisoners, their teams and wagons, were held at the fort. Another factor, though, may have been more instrumental in the company's demise. Col. O. E. Learnard was appointed by General Denver to inspect the Kansas militia. Included in the inspection were Chelsea's "Irregular Troops" who were then receiving rations from General Hunter. Perhaps because threats to the community's well-being appeared to have subsided, Col. Learnard ordered supplies to the

men discontinued "unless they go into the regular service" (The Emporia News, Jan. 4, 1862). The Chelsea militia was thereby dissolved. "Fort Bend" was "abandoned and left to decay," and according to the Walnut Valley Times, "its history exists only in tradition and in the memory of the early settlers" (Mar. 26, 1906). A report on the unsuccessful attempt to locate Fort Bend can be found in Brown (this volume).

The fear of a Confederate reprisal proved unfounded and although an anticipated Cherokee attack never materialized, the area was nevertheless invaded by Indians in January, 1862. P. G. D. Morton informed the Emporia News that approximately 300 Indians had arrived "in the neighborhood of Chelsea, having been driven from their homes" (Jan. 18, 1862). G. T. Donaldson and Martin Baught had met the hapless Indians at Sutton Branch. The Indians had fought with and were defeated by their "Secession brethern," a chapter too rarely cited in Civil War history. Twelve thousand Indians, mostly Creek, were thought to be on their way to Kansas to rendezvous on the Walnut River as their chief had commanded. When only three hundred arrived the settlers feared that the main body of the group had fallen into the hands of the secessionist faction. Those who had reached their destination were "in very destitute circumstances." As Martin Vaught recalled, "They suffered terribly from exposure and hunger, the weather being severely cold and a foot of snow lay on the ground" (Walnut Valley Times, Mar. 8, 1895, p. 4). According to Vaught, he and other Chelsea area residents,

> Did all we could to relieve them....They camped on the Gaskins, now the James Teter farm, two miles from El Dorado. While awaiting relief and supplies from their agent at Lawrence we turned over 600 bushels of corn and some oxen for beef. A more grateful people I never saw. Some of their children were so starved they could not wait for food to be cooked but ate raw corn and beef. Many had their hands and limbs frozen.

Although Chelsea's citizens claimed that they were doing their best to assist the Indians, their numbers may have overtaxed the community's generosity or its means. An article in the Emporia News suggests that additional assistance was required.

> What is to be done for them it is hard to tell, but they should not be permitted to suffer. We are told that the Government owes them a large sum of money in the way of annuities. If this is so they should be paid at once. These Indians, who have stood out for the Union, and have been driven from their homes, deserve the kindest and promptest treatment (Jan. 18, 1862).

Mr. C. C. Tuttle of Topeka was appointed by Indian Agent G. A. Cutter to investigate the condition of the "Union Indians" and to provide them "temporary relief from their suffering" (The Emporia News, Jan. 25, 1862). By the time Tuttle arrived in Chelsea nearly

one thousand Indians had arrived. He quickly purchased supplies of beef and corn from area residents to distribute among the destitute. Tuttle then arranged for the Indians to be removed to the junction of the Cottonwood and Neosho Rivers near Emporia. Explaining the move, the Emporia News reported, "Mr. T. had to pay fifty cents per bushel for corn, and a proportionately high price for other articles. They are here because these articles are more plenty, and cheaper." (Jan. 25, 1862).

The "Union Indian" migration through Chelsea afforded the community only a brief diversion from the larger conflict which wracked the nation. The conflict which had so disrupted the lives of the Indians was not without a direct effect on the Chelsea community. The impact of the Civil War was in part conveyed in a letter written to C. S. Lambdin from his son, Milton. The Emporia News printed the letter to demonstrate the patriotism of a Chelsea native and to encourage emulation of his behavior. The paper reported that although Milton had a brother and other relatives in the South, he considered his duty "first to his beloved country, even if he should have to fight some of his relations" (May 18, 1861). The article concluded with the prayer, "May the God of battles go with him."

The personal message to C. S. Lambdin, however, reveals more than the patriotic fervor of his son. The letter communicates a sense of the emotional conflicts which accompanied a soldier into battle.

Wheeling, April 29, 1981

Dear Father and Brother:

With feelings of deepest regret I commence the answer of your letters....I have been halting between home and war...and now I must tell you that I am determined to enlist in the cause of the Stars and Stripes, and fight for our glorious Union. Companies are going from this section of country continually. "Each blast blows to our ears the clash of resounding arms," and we here in the western part of Virginia have stout hearts and strong arms, and are panting for the fray, and eager to go. I may not be acting in accordance with your direct wishes, but nevertheless my heart tells me to go. I shall deeply regret to leave you all in this exciting time, but I shall also remember that I am fighting for my kindred, if I should be compelled to fight against a few of them. I am human, and have a heart. I love my dear parents, brothers and sisters, and all my friends; but oh, God! when I so far forget this our glorious Union and its ensign, as to turn traitor and raise an arm against it, may that arm wither and fall from its socket! I am for peace all the time, but the only way to obtain peace is to fight for it.

As previously noted, by the Fall of 1862 most of the young men of Butler County had followed Milton Lambdin's lead and joined the Union Army. Settlers "who had any place to go, left the frontier. And as the hard days of the war came on, Butler County had hardly population enough for a corporal's guard" (Harrison, Walnut Valley Times, June 16, 1876). According to William Harrison, the settlers who remained lived in constant fear of "bushwackers from the south" and "wild Indians from the west." But possibly most alarming to Butler County residents were the activities of some of their own number who were again engaged in the business of stealing cattle and horses from the "Indian Nation." The illicit trade reportedly became an enterprise of considerable proportions. William Harrison estimated that "Many thousands of cattle were driven from the Nation and came to Butler County" (Harrison, Walnut Valley Times, June 16, 1876). County residents were justified in their fear of the rustlers, for as William Harrison recalled, "Many of the men engaged in that disgraceful and lawless business were of the very worse class and paid little respect to the property of anyone." According to Harrison, the lawbreakers "came from many of the states to engage in this stealing. Even old puritanical Massachusetts was represented among these thugs of the plains." Assistance provided by the government proved crucial. "I think if a company of soldiers had not been sent to our relief, Harrison explained, "the moral, law abiding citizens...would have been driven out, for at one time the brigands were largely in the majority, and rode booted and spurred over those who opposed them." Even so, Harrison wrote of his compatriots, "We were always ready for a fight or a run." This attitude was reflected in actions taken against a band of Butler County residents driving a herd of rustled cattle through the county. The thieves were pursued, overtaken, and in the ensuing confrontation, three were killed (Harrison, Walnut Valley Times, June 16, 1876).

In the early 1860's confrontation and death were an all too common phenomenon. On the frontier as in the North and South, the terrible consequences of civil war were made painfully clear. Millions were displaced or injured; millions died. Though not counted in the grim statistics, Chelsea might well be listed among the mortally wounded. While it is impossible to know what might have been, it is not difficult to assess the war's impact on the frontier community. By responding to the North's call to arms, the men of the community diverted their energies to the Union's cause. At a critical point in Chelsea's development the Civil War drained the town's lifeblood and prevented the transfusion of ambitious new settlers. During the war Chelsea lost both the momentum of its progress and preeminence within the county. While the Chelsea community survived, the town floundered.

As the Civil War ended, the migration westward was not only renewed but intensified. Chelsea's growth, though, could not match that experienced by El Dorado. Located at the crossroads of the Osage, California, and Emporia trails, the latter began an extended period of rapid development. El Dorado's emergence as a dominant force in Butler County was manifest in an election called to decide the location of the county seat. The election, held May 21, 1864, resulted in an El Dorado victory. But the

Chelsea dominated commission responded by requiring that a courthouse be procured prior to the removal of the county seat. This attempt to forestall the move proved only temporarily effective, however, for in 1867 the issue was again brought to a vote. As in 1864 El Dorado won the election, having garnered 50 votes to Chelsea's 29. Anticipating the outcome, El Dorado had constructed a courthouse; the transfer of the county seat from Chelsea to El Dorado could be delayed no longer.

In addition to the county seat, Chelsea suffered the loss of many of its most prominent and enterprising citizens in the year immediately following the Civil War. J. C. Lambdin sold his half of the Chelsea townsite in 1864, moved to El Dorado, and became a principal entrepreneur and leading citizen. P. G. D. Morton left the area in 1868 after selling his half of the townsite. J. K. Nelson, who purchased the land, proceeded to farm the tract known as "Chelsea Hill." Alva Sheldon, another former Chelsea resident, also established himself in El Dorado. As a reporter and ultimately as publisher of the Walnut Valley Times, Sheldon became a highly respected and influential El Dorado resident. Lambdin, Morton, Sheldon and many others found that Chelsea could no longer afford them the opportunities they sought. They left and Chelsea, the town, died.

But here the history of Chelsea, Kansas, did not end. Though the town died, the Chelsea community survived, and in the ensuing years was strengthened by increased settlement. Gradually a determination to re-establish Chelsea emerged. A new town company was formed uniting both established and recently arrived settlers in the effort. The Chelsea Town Company, composed of E. Bishop, John M. Rayburn, J. E. Buchanan, John B. Shough, J. B. Persons, O. E. Sadler and Martin Vaught, was incorporated on November 1, 1870. But the town building effort considerably predated the formal incorporation and involved a man not listed among the town company's members.

Chelsea's resurrection may have been foreshadowed in 1868 when the post office was moved to G. T. Donaldson's farm one mile from the original townsite. The new town was plotted on land Donaldson owned in the spring of 1869. As early as July Donaldson began to sell town lots. On July 2, 1869, Martha Shough purchased block 17 from G. T. and E. V. Donaldson for $50 (Deed Book A-228). Four days later Donaldson deeded the townsite to the Town of Chelsea (Deed Book A-214). That winter a one story pine lumber school house, 26x38 feet was constructed on the townsite by Chelsea residents Bishop and Gordon. Also prior to the town's formal incorporation, John Houser opened an open-air blacksmith shop and J. B. Shough began construction of the Chelsea House hotel.

Because the new town was plotted on land he owned, G. T. Donaldson stood much to gain from the town's success. Although he had deeded the townsite to the Town of Chelsea, Donaldson retained a substantial amount of property within the townsite. As Chelsea grew the value of his property would increase dramatically beyond its farmland potential. His ambitions were illustrated on Chelsea's town plat which included a large addition for future expansion appropriately named "Donaldson's Place."

To ensure the town's success, the Chelsea community mobilized to wage a campaign to regain the county seat. This feat could be accomplished, it was thought, by splitting the county and forming a new county seat, or by wresting the title from El Dorado. With G. T. Donaldson at the fore, either possibility may have seemed plausible, for he was clearly one of the most highly respected men in Butler County. He had served his fellow settlers on the frontier, his county in the state senate, and his country as a Union Captain in the Civil War. He was a dynamic leader whose continued efforts in Chelsea's behalf might well have ensured the town's success if not the county seat. But it was not to be; G. T. Donaldson was killed in an accident while hauling logs, November 4, 1869. Though Mrs. Donaldson attempted to continue what her husband had begun, neither she nor anyone of his stature could fill the void. Consequently, in 1870 Chelsea was again engaged in a losing battle with El Dorado for possession of the county seat.

Even without G. T. Donaldson, the contest for the county seat was fiercely contested. No quarter was asked or given. A lively but rather one-sided debate was chronicled in El Dorado's Walnut Valley Times. As might be expected, the Times was adamantly opposed to the return of the county seat to Chelsea. Disgusted with the smaller town's persistent attempts to take the political plum for El Dorado, the Times mocked and ridiculed the smaller community. Lacking a paper of its own, Chelsea was severely restricted in its ability to successfully wage its own war of words. Chelsea's journalistic inequity, though, did not evoke a committment to even-handed journalism by the Times. In discussions of the county seat question, Chelsea was characterized as "a mere cats paw," a "nothing" (April 8, 1870). Chelsea was pronounced "a dead duck," a town which had already "reached the zenith of her glory" (April 8, 1870).

With tongue in cheek the Times credited Chelsea's residents with imagination in their efforts to procure the county seat. A measure supposedly proposed by Chelsea's J. B. Shough and intended to isolate El Dorado was explained in an article published April 8, 1870:

> Shough is going to kill Eldorado (sic). At a town meeting some time ago, he astonished the natives by making the following proposition: "He would take two yoke of steers and a plow, and plow a wide, long, deep, straight furrow from Chelsea, across the divide to Towanda. This would turn all the southwestern trade from Eldorado. He would then plow another furrow from Chelsea to (the) Little Walnut. This would leave Eldorado eight miles below the 'forks of the road,' and would kill it beyond resurrection." The idea was an original one. It was a "big thing." It failed because of its vastness.

On a more serious level, the Walnut Valley Times accused the Chelsea Town Company of peddling favors for support in the county seat election. The paper alleged, "Town lots are being freely offered by Chelseaites for votes. The trouble is they can't give a deed for the lots; and then

the lots are not worth 15¢ apiece if they were deeded" (April 8, 1870). The paper also maintained, without substantiation, that Chelseaites were in league with land agents from Emporia, who, "presented with town lots to work for the town are blowing for it with a will" (April 8, 1870).

Predicting that Chelsea's various schemes were destined to failure, the El Dorado editor chastized Shough, Buchanan, and other Chelsea boosters, for causing the county taxpayers to pay $300 for an election that Chelsea could not win. Suggesting that nobody would want to conduct business in Chelsea, "the most insignificant point in the county," the Times concluded,

> Sore heads at Chelsea...may as well hang their harp on a willow tree. They are wasting their breath, time and town lots....Chelsea with her corner lots, blowhards, and sore heads will find that they have spent many months of time for naught. They haven't strength enough to control their own township elections, and as soon as the elctions are over will sink into infinitesimal nothingness (April 15, 1870).

Chelsea's designs on the county seat would no longer be dignified by continued coverage of the issue, the paper announced, "Futher arguement is useless."

> We will not fill our paper with articles on the subject any more. We will not give the proposition the benefit of a hearing through the columns of our paper. The proposition is dead and it should be consigned to the grave of all frauds.

Indeed, following election day, May 9, 1870, by a vote of 256 to 524, the proposition was dead (Mooney, 1916, p. 54). But the animosity engendered between the towns remained alive and intense. The Times had slandered Chelsea, its commercial and public interests, and its citizens. Chelsea had been made the butt of the editor's humor, epitomized in the conundrum published April 8, 1870: "What is the difference between Eldorado (sic) and Chelsea? One is the county seat and the other is the seat of the county." Such comments were clearly not calculated to win abiding friendship between the two towns.

While it is impossible to know the extent to which Chelsea's citizens reciprocated, it is probable that at least a few availed themselves of every opportunity to do so. One new El Dorado resident complained that the people of Chelsea had besmirched the good name and character of his newly adopted home. E. Bob Diggins reported to the Times that while passing through Chelsea the people there had intimated that El Dorado was "the last end of nowhere." Upon arrival in El Dorado, however, he "learned that the reasons for such misrepresentations as were given, was owing to a contest between the two places

for the location of the county seat" (June 3, 1870).

Despite the setback suffered in the 1870 county seat election, Chelsea's townsfolk remained committed to their community's progress, and the year was one of growth and hope for a prosperous future. The popular attitude was reflected in the words of one Chelsea resident quoted in the Walnut Valley Times. "Chelsea is improving slowly but surely, and we fondly hope will make quite a town yet, (in) spite of the county seat being located 'now and forever' at Eldorado (sic)" (Nov. 4, 1870). The town's progress was also noted by more objective observers. J. D. Hunter, Editor of the Hamilton (Iowa) Freeman toured the area and reported to his readers that Chelsea was a "growing little town situated in one of the finest regions of country we saw in all our travels. The place contains a fine school house and church, and the many new roofs attested to the rapidity of its this year's growth" (Walnut Valley Times, June 24, 1870).

Another roving reporter, Verdi Montane, reported that in his travels through Southeastern Kansas he had not met with "a prettier town, or a more thrifty village than Chelsea" (Walnut Valley Times, April 22, 1870). Montane explained that the town was yet in its infancy and projected a rapid increase in the town's size and prosperity,

> for several potent reasons: among which are, the beautiful site of the town, which is unsurpassed for an inland town; the excellent land in its vicinity, now being opened for sale, better than which cannot be found in the state; more abundantly timbered and watered than any location in the county.

Montane, who wrote for the Walnut Valley Times as a travelling correspondent, also commented on the superior intelligence of Chelsea's inhabitants and the superlative educational opportunities afforded their children. "With such natural and social advantages," Montane wrote, "Chelsea cannot fail to retain the more desirable portion of immigration to this section of the country, and ultimately become the STAR of the county" (April 22, 1870).

Another travelling editor, Mr. Stotler of the Emporia News, also observed the development of Chelsea and Butler County. He indicated that much of the land around Chelsea was "principally owned by speculators," and that its settlement had been "somewhat retarded on this account." Chelsea itself, he reported, "is growing rapidly." Stotler estimated that between 15 and 20 new houses had been built recently, including a new church and school. Stotler informed his readers that J. B. Shough was just getting his recently erected hotel in running order. J. W. Beal had just opened a large store, and "several new establishments of various kinds . . . (had) recently been opened in this town." The Emporian admired the town's citizens, whom he found to be of "the driving kind thoroughly devoted to building up the town and country." The editor predicted, "They will succeed we do not for a moment doubt" (Walnut Valley Times, May 20, 1870).

One of the most impressive improvements in Chelsea during 1870 was the erection of the Donaldson stone house. References to the large two-story structure were made in both the Emporia and El Dorado newspapers.

Chelsea residents took pride in the home, and the Times was kept alert to progress toward its completion. In one letter to the paper Mrs. Donaldson's "magnesian limestone" residence was reported to be ready for plastering. According to the letter's author, "It is said to be the finest building of the kind this side of Emporia, and presents a handsome appearance from 'Chelsea Hill'" (November 4, 1870).

Chelsea's growth in 1870 undoubtedly fostered a sense of confidence in the community's future. This confidence in continued progress was evident in a letter written by a Chelsea resident and printed in the Walnut Valley Times. The writer not only boasts of Chelsea's progress but also warns El Dorado that Chelsea is yet a force to be reckoned with. "Considerable improvement is now going on and more is anticipated for the coming year, so, let Eldorado (sic) look well to her laurels or Chelsea will get her Town Company at work and smash her yet" (November 4, 1870). Although the warning may have been stated with a degree of humor, the writer and others in Chelsea had cause to harbor hostility against the larger town.

With the county seat seemingly assured, El Dorado initiated a thaw in the icy relations between the two towns. Chelsea's electorate was not strong enough to regain the county seat, but the community's votes might prove valuable in other elections of concern to El Dorado. One such issue arose only several months after the county seat election, and involved a railroad bond issue. Anxious to acquire railroad service, El Dorado boosters attempted to convince county residents that a railroad through the county seat would benefit the entire area. Consequently the arrogant and inflamatory rhetoric expressed toward Chelsea in the Walnut Valley Times was transformed toward a message of conciliation. "To our friends at Chelsea, we say a truce--we wish to 'bury the hatchet' and hold out the 'olive branch.'" But this cordial gesture was not strictly magnanimous, as the next lines suggest.

> "Let us have peace," and join hands in this great railroad enterprise which so vitally interests all, ever remembering our noble national motto, "E pluribus unum." Now let us rise as one man and take measures to put ourselves at once in connection and communication with the live world. (July 5, 1870).

Chelsea, though, was much more interested in acquiring railroad service of its own. Resigned to the permanent loss of the county seat, Chelseaites turned to the railroad as their ticket to prosperity. Chelsea was on the route of the Kansas Stage Company, but the stagecoash could not approach equivalent advantages. So Chelsea boosters began a series of efforts to obtain railroad service. As early as April, 1870, J. W. Hess, a member of the Chelsea Town Company, was reportedly claiming that his community would vote enough bonds to induce the Sedalia, Ft. Scott, and San Francisco Railroad to make Chelsea the first stop in Butler County (Walnut Valley Times, April 29, 1870).

Bolstered by the belief that Chelsea would soon have railroad service, the townspeople engaged in community development and private enterprise

with a new intensity. The town company awarded a contract to M. B. Shough, proprietor of the Chelsea House hotel, to fence and plant trees on the public square (Walnut Valley Times, November 4, 1870). A deed recorded in the Butler County Courthouse indicates that Shough was to receive one-half of a town block upon completion of the assigned tasks (Deed Book G-487).

Although the exchange of work or other favors for town lots may have been common in many fledgling communities, Shough's contract with the town company is the only such transaction recorded in deeds involving Chelsea town lots. It is possible, however, that agreements between the town company and private individuals were more common than the deeded transactions indicate. Several of Chelsea's citizens are known to have operated various businesses yet no deeds are recorded by which they acquired or disposed of town lots. It is possible that these individuals rented from the town company or other property owners. It is also possible that the town company encouraged development by offering town lots to individuals willing to engage in certain business operations over a stipulated period of time. Short-lived business concerns, then, would not have resulted in a transfer of property ownership.

The town company may also have encouraged the settlement of skilled individuals by offering them attractive inducements. Developing towns were particularly interested in attracting and retaining members of various professions. Medical doctors, for example, were especially welcome. Dr. John Zimmerman, formerly of Bloomington, Illinois, was enthusiastically received by Chelsea residents as the town's first doctor. In a letter to the editor of the Walnut Valley Times a Chelsea correspondent observed, "We need just such live men as the doctor" (November 4, 1870).

Following his arrival in 1870 Dr. Zimmerman purchased the south half of block 6 and several sections of land near Chelsea (Deed Book C-213 and Walnut Valley Times, November 4, 1870). The property in town, consisting of four lots, cost the doctor one hundred dollars. But in 1872 when he purchased the north half of the same block, he was only required to pay four dollars. In 1872 the town company may have feared that Zimmerman would move his medical practice elsewhere and to preclude this possibility offered him town lots at a price he could not refuse. It is clear, though, that in 1870 the doctor envisioned a substantial, thriving business. In November Zimmerman was building one residence while making plans for a more substantial dwelling and a large stone drug store to be built the following spring. The doctor's timetable was evidently moved up, however, for by December the store was approaching completion. Of the new structure a Chelsea resident proudly wrote, "It adds much to the appearance of the town" (Walnut Valley Times, December 2, 1870).

Chelseaites were very conscious of their town's appearance. The community took great pride in Dr. Zimmerman's drug store, the Donaldson home and Chelsea's school house. But the community also took pride in their programs of cultural enrichment which they considered synonymous with education. Chelsea's residents were not satisfied with the educational standards of other communities. Nor were they content to have the most impressive educational edifice in the county. They were determined to provide Chelsea's students with the opportunity to reap the benefits of a superior education by making an impressive building a still more impressive

educational facility. The town company, therefore, "furnished the schoolhouse throughout . . . with new desks, patent cast iron, tertulian, globes, magnet, cubical blocks, &c" (Walnut Valley Times, November 4, 1870). Interior walls were graced with crayon drawings and oil paintings. A teacher was hired at the considerable wage of $50 per month "to ring the bell and exercise the children of the district, both mentally and corporally." The town was blessed by a series of outstanding teachers who were attracted to Chelsea because of its obvious commitment to and investment in the education of its children. T. B. Buchanan, the Butler County Superintendent of Public Instruction, was a Chelsea resident. Mr. Robards, one of Chelsea's first teachers to serve in the new schoolhouse, later followed Buchanan in that position.

But education was not considered solely the province of the community's youth. By the fall of 1870 Chelsea's residents were organizing the county's first literary society and lyceum. Such endeavors were considered worthy entertainment. As one society member explained, "Twill while away some of the coming long evenings, very pleasantly" (Walnut Valley Times, November 4, 1870). Perhaps implying that Chelsea was the cultural if not the political center of the county, the citizens of El Dorado were encouraged to "come up and help discuss some of the leading questions with us" (Walnut Valley Times, November 4, 1870). Among the topics "thoroughly ventilated by the members: was the 'woman question,'" a topic that is yet being "ventilated" today.

Chelsea's concern for the education of its citizens was not lost on those who reported the community's progress. Verdi Montane of El Dorado reported that settlers of Chelsea township were "of a superior type--intelligent, refined, honest and honorable." Montane explained his observations thus, "Understanding that 'Knowledge is power,' and accordingly interested in the cause of education, they spare no pains or expense to afford their children the best opportunities in this direction." Further, Chelsea attracted settlers of similar concerns and commitments. Montane reported that "those who have more recently located in town, go heart and hand . . . in everything calculated to develop and refine the people, and adorn and beautify the town" (Walnut Valley Times, April 22, 1870). A correspondent travelling from Bazaar to El Dorado in the summer of 1870 found Chelsea "full of wide-awake, intelligent citizens surrounded by a good country settled by a good class of farmers" (Walnut Valley Times, August 5, 1870).

The people of Chelsea were concerned with the moral as well as the mental development of their community. As at the original townsite, the Chelsea schoolhouse served double duty as the Chelsea church. In April, 1870, Rev. D. L. Knowles of the Methodist Episcopal faith ministered to a congregation in Chelsea (Walnut Valley Times, April 22, 1870). Rev. Gordon preached "acceptably once in two weeks" during the following winter (Walnut Valley Times, December 2, 1870). Through the years Chelsea's church services provided an environment for moral uplift, social interaction and cultural expression. The importance of the latter is reflected in an editorial comment directed to the people of Chelsea from one of their number.

> One hint to the good people of Chelsea. Isn't there some way by which our church and Sabbath school singing can be improved? Such singing is unworthy of the intelligent people of Chelsea. We have those among us competent to teach the science of music, and the evenings are long. The teacher should be secured and the opportunity improved. Were our singing better, the attendance upon church would be larger. (Walnut Valley Times, December 2, 1870).

J. G. Becker answered the call, ordered songbooks and organized a singing class of approximately 50 pupils (Walnut Valley Times, February 24, 1871). A resident who viewed the instruction reported being "pleased at the good order and discipline" in the class. In Chelsea, music was used to sooth the soul, discipline the mind, and even to strengthen the body. In the Chelsea school calisthenic exercises were performed with musical accompaniment. Music and exercise were combined to "add grace to the person and strength to the limbs and lungs." The addition of music was considered highly successful, for as one witness claimed, "Their calisthenic exercises seem almost perfect" (Walnut Valley Times, February 23, 1871).

Letters from Chelsea residents to the Walnut Valley Times often emphasized the town's cultural and intellectual endeavors. These letters were calculated not only to inform, but more importantly to attract new settlers and entrepreneurs by suggesting the abundance of leisure time and other benefits available to community residents. But for many the period of Chelsea's rebirth was anything but one of leisure. One group, the community's farmers, were obliged to toil long hours in the fields. Despite exhaustive efforts they remained vulnerable to a variety of natural calamities. In November, for example, excessively wet weather destroyed hay stacked in the fields. Several area farmers "lost large quantities in consequence of the showery weather," and were "somewhat disgusted with 'drouthy Kansas' in consequence" (Walnut Valley Times, November 4, 1870). The trial by water in November, 1870, was followed with a trial by fire in December, when one Chelsea resident observed that the skies were "lit up by the flames of the burning prairies" (Walnut Valley Times, December 2, 1870). Several farmers who had escaped the destruction of their crops by water were less fortunate with fire. North of Chelsea Mr. Sheldon lost nearly ten tons of hay in one prairie blaze.

It is also doubtful that Chelsea's entrepreneurs enjoyed an excess of leisure time. Dr. Zimmerman's ambitious building activities have been discussed, but others were also quite active in their business affairs. Some, like B. F. Gordy, were speculators who owned and sometimes improved property in several Butler County towns. Such speculators may never have intended to live in Chelsea but hoped to capitalize on the increased land values that accompanied the town's growth. In May, 1870, Gordy paid the Chelsea Town Company $120 for four town lots (Deed Book B-312). Within two months he had improved the property by building a house advertised as "18x23 and one story and a half high, good frame, built of pine lumber." Gordy asked $450 for this improved property; he received $375 from George Moon little more than three months after he had acquired it from the Chelsea Town Company (Deed Book C-352).

Leisure time was uncommon for other entrepreneurs who, like Dr. Zimmerman, perceived Chelsea as an opportunity to establish profitable long term business operations. J. B. Shough was another such individual. In addition to his hotel, Shough put up a large barn, a house, and established a lumber yard in Chelsea (Walnut Valley Times, Jan. 20, 1870 and Feb. 24, 1870). However, like many of his contemporaries, Shough determined at an early date the wisdom of owning property around as well as in the town. The Chelsea stalwart established himself on a farm ten miles north of town in the Spring of 1871 but returned to reside at his hotel again in the Summer of 1872 (Walnut Valley Times, May 19, 1871 and Aug. 30, 1872).

J. M. Rayburn, like Shough one of Chelsea's most prominent citizens, also wavered in his commitment to Chelsea town life. He also sold his house and Chelsea town lots and moved to a farm. The townspeople lamented the loss of both J. M. and Mrs. Rayburn who was herself a figure of importance in the community. It was Mrs. Rayburn who had organized the "sociables" to raise the funds used by the town company to build and equip the Chelsea school. On her departure it was feared that nobody would "revive the sociables" to procure the needed schoolhouse steps. The steps were considered the essential element yet missing from their otherwise over impressive structure. Reflecting community sentiment, one resident complained, "It don't reflect any great amount of credit on our part to have as good a school house, otherwise well furnished without steps or with such as jeopardize one's neck" (Walnut Valley Times, Feb. 24, 1871).

Although Mrs. Rayburn was Chelsea's social leader her departure did not result in the breakdown of all social festivities. Chelsea managed to give "a grand ball" shortly after the Rayburns sold their town properties. Nevertheless, the community undoubtedly welcomed the Rayburn family back into the fold when they, like J. B. Shough, returned to live in Chelsea.

While J. M. Rayburn and J. B. Shough represent ambivalence toward life in Chelsea, another resident represented the emotional roller coaster that typified Chelsea's history. Mr. Lee arrived in town in 1870 and proceeded to prepare for the opening of a saw and grist mill. Having failed in several attempts to acquire a mill the previous summer, the community was elated by the prospect. Mr. Lee was considered "Thoroughly in earnest" about building a mill that would be "readily appreciated and used" by the people in and around Chelsea (Walnut Valley Times, Dec. 2, 1870).

By January, 1871, Lee had received the boiler and other machinery for the mill. Everything had arrived except the engine, which he was reportedly "Having quite a serious time getting" from Emporia (Walnut Valley Times, Jan. 20, 1871). Chelsea's citizens remained confident, however, for Lee was said to have "that pluckiness and push which is often the first requisite of success." Even before he had received the mill's engine, Lee contracted lumber for ten or twelve houses to be put up as soon as possible and area residents began hauling logs to be cut at Lee's Chelsea mill. J. B. Shough, never one to pass an opportunity,

took part in this enterprise in a big way. He reportedly "drew in quite a large vegetable to the mill in the shape of a sycamore log" (Walnut Valley Times, Jan. 20, 1871). This "vegetable," described as being 12 feet long and 5 feet 4 inches in diameter, "taxed five yoke of oxen and Shough's hinge power heavily to draw it."

By February Lee had received and installed the mill's engine and opened for business. The community was well pleased with the mill and Lee's "lively and good work" (Walnut Valley Times, Feb. 24, 1871). In April Lee fenced his half block and dug a cellar in preparation for the erection of his new house. But just one month later he "took the southern fever, pulled up stakes and left for Douglas or that vicinity" (Walnut Valley Times, May 26, 1871). Lee was obviously offered greater opportunities in the larger town which had a greater market. While it is not known precisely what induced Lee to leave Chelsea so suddenly. and after so much constructive work in the community. the El Dorado paper had earlier reported that Douglas was "giving away business and resident lots to those who will improve them" (Walnut Valley Times, Nov. 11, 1870). For such a coup Douglas may have offered these inducements and/or others which the "pluckiness and drive" in Lee could not ignore.

Lee's departure left the Chelsea community once again dependent on El Dorado mills. This proved to be "quite a disappointment to many who had finished putting in their crops and were ready to begin hauling logs" (Walnut Valley Times, May 26, 1871). But Chelsea's more optimistic citizens undoubtedly took comfort in other more positive developments. Chelsea correspondents to the El Dorado newspaper announced with unconcealed pleasure the arrival of each new area resident, the construction of new buildings and the opening of most every business. Such information was not provided solely for local consumption; as in the past it was also meant to attract further settlement and additional development. Prospects for the future, such as railroad service, were also promoted to achieve similar results. When Chelsea's growth abated, correspondents emphasized the quality of the surrounding farmland and the bounty of the farmer's crops. When the town was making rapid progress, crops were mentioned less prominently. In essence, through letters to the Walnut Valley Times, Chelsea boosters utilized El Dorado's paper to accentuate the positive and minimize the negative.

In January, 1872, Chelsea residents were disappointed to learn that their plans for a railroad had again fallen through. The disappointment was particularly acute because the Walnut Valley Railroad "was talked up" until Chelsea's expectant citizens "could almost hear the whistle" (Walnut Valley Times, Jan. 16, 1872). Yet in the face of this frustration some of Chelsea's "prominent citizens" began to plot anew the arrival of another railroad. A number of the town's citizens hoped to accomplish this feat by voting enough bonds to entice the Scott & Humboldt Railroad to alter their route from Augusta to Chelsea.

With renewed hope of a railroad through Chelsea, the town's entrepreneurs turned to their various concerns with vigor. J. W. Hess and Mr. Finley began work on a new mill despite the cold weather. A new grocery and dry goods store was opened by Watson. McWhorter and

Leaken were "doing apparently a thriving business" in their store as was J. A. Edmiston in his. Farnham and Bone erected a new cabinet shop in a building designed for the purpose (Walnut Valley Times, Jan. 16, 1872). Chelsea's health showed other signs of improvement as well. Dr. Sparks, Chelsea's second medical doctor, was "favorably received by the people" and his practice rapidly increased. Unfortunately the relationship between the two presumably competing doctors was not chronicled in the press. While the town may have been better served, the practice of each may have suffered from the presence of the other.

Through the spring of 1872 Chelsea's residents became more optimistic about their community's future development. New concerns arose for increasing access to the town. A petition was circulated "praying for the opening of a road and the building of a bridge across the Walnut, on the township line southeast of town" (Walnut Valley Times, Apr. 19, 1872). The road and bridge were thought necessary because access to town from the west side of the river was made difficult by the backwater of the dam constructed for the new water-powered mill. Heavy rains had caused the water to run around the dam, doing little damage but compounding the transit problem. The mill itself was not yet complete. The machinery had arrived and was scheduled for installation and operation soon.

Also thought to be in operation soon was a Chelsea newspaper, a crucial and long overdue instrument of town building and boosterism. The lack of a newspaper had severly handicapped Chelsea in its efforts to attract new settlers and to state its case in county elections. Chelseaites were thus well pleased that the recently arrived Mr. Wirley intended to establish a newspaper in their community that would "represent Democracy--pure" (Walnut Valley Times, Apr. 19, 1872).

As May, 1872 began, Chelsea's tempo was still upbeat. The saw and grist mill was in operation "propelled by the water of the 'raging' Walnut!" (Walnut Valley Times, May 17, 1872). Improvements in the town were making Chelsea a "right smart" place. A "good, substantial fence" was erected around the school house grounds. The town company directors made plans to plant additional forest trees on the grounds "as soon as practicable" (Walnut Valley Times, May 17, 1872).

Friction with El Dorado over a proposed Fifth Parallel Railroad route signaled the beginning of another particularly trying time for the Chelsea community. This route would make El Dorado a railroad center but would bypass Chelsea altogether. Editorial comment from El Dorado claimed, "we speak the words of truth and soberness when we say the East & West Road through Chelsea is quite improbable." Accordingly, Chelsea's citizens were urged to support the development of a railroad center "as near as possible." In a style reminiscent of the paper's editorial comments during the county seat controversy, the Walnut Valley Times satirized Chelsea's supposed strategy for becoming "the town of Butler County."

> First, remove the County Seat to Augusta. Second, kill Eldorado. Third, divide the county in such a way as to make Chelsea a

> county seat. Fourth, vote bonds to two railroads crossing at Chelsea (May 10, 1872).

The Times volunteered, "We do not believe this plan feasible." Warning that inter-town rivalry could jeopardize the county's ability to obtain any railroad service, the Times implored the voters of Chelsea and other Butler County towns to support the Fifth Parallel Road (May 10, 1872).

As prospects for the approval of the Fifth Parallel Road increased, Chelsea's hope for direct railroad service diminished. One resident reported the common "fear" that Chelsea would not get a railroad, though determined townsfolk were not yet ready to admit defeat (Walnut Valley Times, June 7, 1872). Other clouds, however, began to darken Chelsea's sky. A "terrible flood" struck town and washed out part of the mill dam. What other damage was sustained is unknown. Sickness took the lives of several young adults in the community, including the twenty year old daughter of J. M. Rayburn and the twenty-two year old son of John B. Shough. The latter was reported to have died of consumption (Walnut Valley Times, May 17, 1872). These tragedies may have been compounded by the absence of church support, for as one resident noted, "Chelsea needs a pastor to take charge of the church and sabbath school. We have had no preaching for some time and the sabbath runs itself here" (Walnut Valley Times, June 7, 1872). Church services were later resumed, but the community was required to do without during a time of sadness and frustration.

Chelsea boosters had little to boast about as 1872 drew to a close. One citizen pronounced Chelsea alive but admitted that "a stranger passing through would say that the town was dead" (Walnut Valley Times, Dec. 13, 1872). Even Chelsea's mill, "that once would crash through one log per day, if started early," was stilled, victimized by the lowering of the Walnut River. Yet, as had become their custom in times of frustration and disappointment, Chelseaites took comfort in the success of their cultural endeavors. Mr. Wirley had departed, and with him went the dream of a Chelsea newspaper. But the community took pride in a recently organized Literary Society and its paper, the Chelsea Luminary. "Considering that our village is small and situated in a sparsely settled region," wrote a Chelsea correspondent to the Walnut Valley Times, "we think it a grand success, and therefore we claim the right to feel a little proud of it" ("Occasionally," Dec. 13, 1872). The Luminary's editorial management rotated from month to month and is known to have involved Mr. S. M. Patton, Aggie Rayburn, Mr. R. Lakin and Mrs. Rayburn. Unfortunately, no copies of the Chelsea Luminary have thus far been recovered.

The Literary Society afforded Chelsea citizens "much pleasure and amusement" through the winter of 1872-1873, after which it was "adjourned" with the expectation that it would resume again in October ("CC", Walnut Valley Times, April 4, 1873). While the society was officially adjourned in the spring of 1873, not all of its members terminated their epistolary exercises. The opening lines of a letter to the El Dorado paper reflects both an interest in poetic form and disappointment in Chelsea's progress:

Dear *Times*:—"The first bird of Spring
attempted to sing,
But 'ere he had sounded a note,
He fell from the limb, a dead bird was him,
And the music had friz in his throat."

The writer, a long-standing Chelsea booster, glumly reported, "The above expresses the true state of affairs in this burg this morning" (April 4, 1873). Not all Chelsea residents were so dismally pessimistic. Following an extended lull in building activity, Dr. Sparks began construction of a house in the northern part of town. Complete with a "splended cellar under it," the house was thought by some in town to have a mansard roof, though none had actually seen one (*Walnut Valley Times*, April 4, 1873). McWhorter and Lakin also demonstrated optimism in Chelsea's future by refitting their store with new shelves and counters.

The seeming polarity of opinion concerning Chelsea's vitality was breached by a permeating sense of ambivalence. Residents were probably hopeful but not overly optimistic. Such ambivalence, however, did not necessarily preclude nor diminish the booster spirit of some Chelsea residents. A letter to prospective settlers from J. A. Edmiston contained numerous booster themes, prefaced with the comment that the writer would content himself with "a plain truthful statement of facts and statistics" (*Walnut Valley Times*, April 18, 1873).

Through the columns of the *Walnut Valley Times*, Edmiston described Chelsea as a small community of about thirty-five families living "within convenient distance" to patronize the town's post office. Land bordering the three streams that juncture near Chelsea was characterized as "overgrown with (an) abundance of timber." Consequently, "Fuel, and timber for other purposes, could be had cheaper here than in many places in the timbered state of Indiana." Not only was good land bordering the streams blessed with water and timber, but, very importantly, it could be purchased at "very reasonable terms." Town property, too, improved or otherwise, could be bought "cheap and on easy terms." This was so, Edmiston claimed, because Chelsea had no professional land or town-lot speculators to "blow up" prices.

As was customary with Chelsea boosters, Edmiston emphasized the community's "commodious," well furnished, and entirely paid for school house. Further, Edmiston maintained, "The superior ability that we possess for sustaining a school without a burdensome tax is an item worth the attention of men who have families, and who are looking for locations."

To demonstarte the "superior average culture and intelligence" of Chelsea's people, Edmiston included in his letter an extensive listing of publications received at the Chelsea post office. The Literary Society was also praised as "one of the best conducted, and most successful institutions of the kind in Southwestern Kansas, notwithstanding there are so few to sustain it..."

Chelsea's high moral standing, Edmiston observed, was exemplified "by the simple fact that NO STRONG DRINK IS KEPT FOR SALE HERE." The

writer reported that he had never heard of any serious trouble in Chelsea resulting from drunkenness. Another indication of Chelsea's moral fiber was the community's commitment to the church and Sabbath services. According to Edmiston, "It is believed that our religious privileges are superior to most places with so small a population." Chelsea boasted a Methodist Episcopal organization and an organized Presbyterian Church with a "settled Pastor."

With such substantial advantages, Edmiston openly admitted wondering why Chelsea was "so much overlooked by persons looking for locations for new homes." He reported seeing families of obvious means and enterprise passing through Chelsea to continue further Southwest,

> where they will certainly have a struggle, and pay high taxes, and undergo hardships and privations, for many long years before they can possess the artificial advantages and conveniences we now have; and many of our natural advantages they never can possess.

Edmiston submitted that the good character of Chelsea's people actually militated against the recognition of the town's outstanding qualities. "Our citizens," Edmiston claimed, "are generally quiet, attending to their own business, having but little disposition to brag or boast; and this may be one reason our advantages are not better known." Thus, Chelsea's residents were portrayed as good neighbors but bad boosters. Edmiston's letter represents an effort on his part to counter the negative effects of the community's lack of pretentiousness. Concluding his remarks, Edmiston wrote, "If good society, good common schools, and light taxes are items worth considering, I do not believe (a man) can do better than to come to Chelsea, notwithstanding its humble appearance." Sending the letter to the Walnut Valley Times to ensure a wide dissemination, Edmiston requested the paper's editor to "give these lines a place in your columns, hoping they may meet the eyes of some good people who are looking for locations in this new county."

Two months after Edmiston sent his letter to the Walnut Valley Times, the Chelsea community was hit by the destructive force of nature. On the 26th of June a severe wind lashed at the town and surrounding countryside. Outside Chelsea proper the storm demolished James Gordy's log house and destroyed a considerable amount of household goods but left the family otherwise uninjured (July 11, 1873). The storm also ravished the recently vacated house near Chelsea owned by S. J. Mantor, "turning the building a complete summersault and leaving it a complete wreck."

From the ruins of the Mantor house the storm fell directly on Chelsea, striking "the hotel" owned by Lakin and Bone.

> But the wrath of the elements was appeased by simply moving the building off the foundation a foot or two without blowing it down, where-

> upon the proprietors with their guests took their hats and marched over to the other hotel to await further results (Walnut Valley Times, July 18, 1873).

The storm next moved to Chelsea's "old academy building" which had been "occupied in early times by the Chelsea High School." It is likely that the structure was located on or near the old townsite and had served as Chelsea's school after the original building was destroyed by fire. Since the erection in 1869 of the "more elegant and commodious edifice... used for educational purposes," the former school house had been "used successively as a store, a family residence and a grain depot." Multiplicity of use, either concurrent or consecutive, was a common phenomenon in pioneer settlement. The storm, however, afforded the building no special consideration for its historic significance. "It was blown down and completely demolished, and with all its historical reminiscences of early times it lies a mass of ruins, not a stone being left upon another" (Walnut Valley Times, July 18, 1873).

For some, the storm may have been the proverbial "last straw," but Chelsea's disappointing lack of development during the last year had already disenchanted many residents. The reporter who chronicled the storm's destruction also wrote of an "exodus" of many from "this portion of the 'Italy of America,'" a description adopted by town boosters at a more prosperous time. Among the "learned gentlemen" departing Chelsea were the community's ambitious doctors, Zimmerman and Sparks. Both abandoned their town lots and ceased paying property taxes. The buildings they occupied were ultimately moved or dismantled for other construction purposes. Zimmerman moved to Cincinnati and Sparks is believed to have gone to Plum Grove, where he practiced medicine and Mrs. Sparks became postmaster. In response to the departure of the town's two doctors, the following notice was placed in the Walnut Valley Times to attract another physician to the community:

> Wanted at Chelsea--A physician: a young thoroughbred doctor with some practical knowledge of his business is very much needed at this time at Chelsea, Butler County, Kansas. One who could keep a small amount of medicine on hand might do well (Sep. 19, 1873).

While a number of Chelsea residents did not join the "exodus" their diminished expectations may have been reflected in the comment that a new doctor "might do well." For doctors, like commercial enterprises, require sufficient clientele to ensure a profitable operation. Consequently, as the town's population declined, entrepreneurs were less able to maintain a profit margin. Many townsfolk, therefore, turned increasingly to agricultural pursuits to fill the void. The town was devolving into an agricultural community center. The transition was noted by a newspaper correspondent from El Dorado who described Chelsea as "the oldest, most literary and most uncommercial town of the county" ("From Our Traveling

Correspondent: Chelsea--Its Age, People and Prospects" Walnut Valley Times, Oct. 24, 1873). The correspondent found the town "surrounded by an excellent country, both for agriculture and stock raising." Contrary to statements made by Edmiston, though, the El Dorado reporter claimed, "The land, unfortunately, is mostly in the hands of Eastern speculators who, until within a short time, have refused to part with it at any reasonable price." Such speculation undoubtedly stifled Chelsea's early development by restricting settlement in the area. In the interim El Dorado, Chelsea's neighbor and early rival, was continually and rapidly growing, providing entrepreneurs numerous opportunities that the smaller community could not offer. By October, 1873, many of Chelsea's businessmen had opted to seek greater opportunities elsewhere.

In the midst of its commercial decline Chelsea maintained a commitment to education and cultural activity. Considered "among the most thrifty and intelligent," the people in and around the town took special pride in being a reading community. An El Dorado citizen noted that, "Their pride in this direction is almost equal to that of Boston and time was, when to hear them talk, one would suppose that to be a resident of Chelsea was equivalent to having a prospect to eternal felicity" (Walnut Valley Times, Oct. 24, 1873). Chelsea's Literary Society continued to publish the Luminary for reading at the community Lyceum. "Sustained by the talent of the members," the paper was reported to have a number of excellent articles. The Lyceum itself provided both entertainment and intellectual stimulation for Chelsea's "numerous scholars." A visitor to the Lyceum found "all the youth and beauty of town and country there congregated."

Considering Chelsea's failure as a political and commercial center, it is not surprising that the town remained steadfastly bullish on education. The schoolhouse continued to be a primary source of community pride, as was the school curriculum which offered such advanced courses as algebra and psychology (Walnut Valley Times, Nov. 28, 1873). Chelsea's emphasis on educational and cultural growth should not suggest that the community had become indifferent to commercial growth. Although already bitterly disappointed on so many occasions, some Chelseaites continued to cling to the faint hope that a railroad would someday transform the little town into a city of commercial as well as cultural enterprise. After visiting with Chelsea residents an El Dorado reporter suggested that this hope might yet become a reality:

> Chelsea, when the Bob-tailed railroad comes down from Cedar Point, and the taxes become too high for speculators to hold their lands, will begin to grow and will some day make a nice little town--never anything of a bigness to compare to Eldorado, but will be to that town what Jersey City is to New York--a nice little place where nice people can send their nice children to goody-goody school and have nothing to molest or make them afraid.

While some Chelsea residents strove to cultivate their intellectual faculties and contemplate their community's future, others sought more lighthearted and entertaining diversions. Horse racing was popular among a number of Chelsea residents in November, 1873. Chelsea reportedly had "a fine race track, and plenty of fast horses" (Walnut Valley Times, Nov. 14, 1873). Chelsea blacksmith John Houser was well known for his fleet-footed mounts which he proudly rode through the streets of El Dorado and the Chelsea countryside (Walnut Valley Times, June 8, 1877). Despite his reputation as a rider of fast steeds, he was challenged to a race by William Smith, the town's grocer, at "$25 a side" (Walnut Valley Times, Nov. 14, 1873). By one account, "Houser's horse came out 49 feet ahead" and Smith determined to "trade his horse for a Texas heifer."

During the winter months Chelsea residents enjoyed a number of entertaining diversions. Hunting proved popular among many of the men in the community. J. E. Buchanan was especially adept at deer hunting, an activity that provided both sport and a ready food supply. The "young folks" of Chelsea particularly enjoyed sleighing in the winter snow. They would attach four horses to a sled equipped with a wagon box and "'go it' after the break neck style" (Walnut Valley Times, Feb. 6, 1874). Despite the seemingly endless series of disappointments and frustrations, those who remained in Chelsea were able to put aside their difficulties and enjoy simple pleasures--the excitement of a horse race, the exhilaration of a swift ride through the snow, or a community Christmas sociable given by the J. B. Shough family at their Chelsea House hotel (Walnut Valley Times, Jan. 2, 1874).

As 1874 progressed, Chelsea's transition from would-be city to farm service and social center was accelerated. The activities of various Chelseaites epitomized this transformation. J. W. Hess sold his much maligned mill to the recently arrived Dr. Andrews. The doctor immediately set to work repairing the waterpowered mill, and by February he was prepared to saw lumber and to grind corn and feed. For the first time the mill's "RATES OF TOLL" were published. Andrew's charged "one-fourth" when corn was worth 35¢ and under, "one-fifth" when corn was worth more (Walnut Valley Times, Feb. 13, 1874).

J. C. Becker, Chelsea's erstwhile storekeeper, "associated himself" with commission merchants for the sale of livestock in Kansas City. Stock men in the area were advised they would "do well to call on or address Mr. Becker before shipping elsewhere" (Walnut Valley Times, May 29, 1874). Stock raising had become an important industry in the area and herds of cattle passed through Chelsea on their way to Emporia (Walnut Valley Times, Feb. 6, 1874).

Another Chelsea resident, E. Bishop, served as Chairman of the Butler County Council of Patrons of Husbandry. And Chelsea hosted the Council's "grand picnic" on the third Saturday in June. All citizens were invited to attend and encouraged to "bring their baskets (if they have any) filled with good things to eat" (Walnut Valley Times, June 19, 1874). Those intending to attend who had no basket were advised to "bring a bushel, tin pan, or washtub, or anything that will hold something to eat." Several hundred persons attended the picnic "in a fine

grove near town." The festivities were declared a "splendid success," and Mrs. Donaldson, Mrs. Pearce, Mrs. Vaught "and several other ladies of Chelsea" were commended for their "courteous attentions" (Walnut Valley Times, June 26, 1874).

As early as January, 1874, the Times of El Dorado noted that "Everybody is turning Granger at Chelsea" (Jan. 16, 1874). Though a realistic response to the community's evolution, the transition was not without drawbacks. As Chelsea became solely dependent on agriculture the community became increasingly vulnerable to the capriciousness of nature. In 1874 and 1875 the consequence of this vulnerability became painfully evident. A flood in late June, 1874, was followed by drought and a grasshopper invasion the following August (Walnut Valley Times, July 13, 1874). The ravenous invaders descended on Chelsea and devoured most everything in their path including J. E. Buchanan's fenceboard, described as six inches wide and one inch thick.

As 1874 drew to a close, however, Chelseaites were concerned with another threat to crop production in the area. In December a group of forty-six hunters from the area converged on John Houser's new blacksmith shop in town and formed the Chelsea Rabbit Club to eradicate the new menace. The club was divided equally into two competing units under the command of their "captains," J. E. Buchanan and J. K. Nelson (Walnut Valley Times, Jan. 8, 1875). After a nine or ten day hunt "not less than 1,000" rabbits were killed. The group with the fewer kills was to provide a dinner for the other, but a misunderstanding over terms of the agreement resulted in hard feelings between the two groups. Subsequently two dinners were given, one each for its own members. Mr. Bishop hosted 130 guests, and F. M. Donaldson, Shough's successor as proprietor of the Chelsea House hotel, entertained "98 grown persons at his supper besides about 26 children" (Walnut Valley Times, Jan. 8, 1875 and Jan. 15, 1875). The animosity engendered in the dispute may have dissipated somewhat following the separate festivities, for both groups later joined together for a dance.

The amusements provided by the rabbit hunt and following celebrations afforded only a momentary diversion from serious community problems. During the latter half of 1874 the forces of nature had combined to significantly diminish the region's agricultural productivity. Winter was therefore accompanied with a requirement for food that area farmers were unable to provide. To avoid starvation some Chelsea township residents were compelled to accept relief. Thousands of pounds of flour and meal were distributed among the destitute. Beans, hominy, split peas, dried apples, rice, and pork were parceled out in lesser amounts. Clothing and bedding were also provided in the relief effort (Walnut Valley Times, Jan. 29, 1875, Feb. 5, 1875, Feb. 12, 1875, and Feb. 19, 1875).

Chelsea's need for relief was undoubtedly a severe blow to the community's pride and booster spirit. Unlike the previous occasion in 1860 when outside help was needed, most of the countryside was farmed and the community had passed the critical dependency of an infant community.

So for some Chelsea citizens relief was a source of considerable embarrassment. Mrs. John M. Rayburn, for example, became incensed on hearing false reports that her husband was receiving aid. She vented her anger in a letter published in the Walnut Valley Times, claiming the report "entirely false" (Feb. 26, 1875). Dr. Andrews, who according to rumors circulating in town had provided a "bundle of aid" to the Rayburns, also issued an angry denial. Andrews wrote that he had not known about the rumor until he read Mrs. Rayburn's "card," for he did not "mix with that class of news mongers, that would trouble themselves to circulate "slanderous reports" (Walnut Valley Times, Mar. 10, 1875). Andrews suggested that jealousy was the foundation of the malicious gossip. He advised his neighbors not to "worry their gizzards about Mr. Rayburn's wants," for he was "perfectly able to take care of himself and family." Furthermore, Andrews maintained, if Mr. Rayburn could not take care of himself and his family, he had "plenty of friends back east" who would.

It is difficult to determine which infuriated Andrews more--the false report about his close friend, or that individuals in Chelsea would spread such "false and unmitigated lies." Reacting to the latter, the doctor wrote, "Those stating such and those reiterating the same are unworthy the name of Christians. A burning shame it is to have such persons living in a respectable community."

Mrs. Rayburn's ardent denial that her husband received aid and Dr. Andrews' suggestion that such reports were "slanderous" represent an attitude that was unlikely to endear them to those in need of such assistance. Tension between various factions in the community was the likely result. In the best of times a community divided by jealousy and animosity will find progress difficult. In the worst of times, progress can be stifled completely. Perhaps symptomatic of the economic and social turmoil, McWhorter's Chelsea store was robbed. A man named Johnson was arrested, tried in the District Court, found guilty and sent "to the Penitentiary" (Walnut Valley Times, Feb. 12, 1875).

As had become customary in Chelsea, with spring came renewed hope of the community's prosperity. By 1875, however, such success was no longer measured by new buildings in town but by the quantity and quality of agricultural production in the surrounding countryside. In May prospects looked good. J. K. Nelson reported from "Chelsea Hill" that he was "hopeful on the all important question of raising a good crop" (Walnut Valley Times, May 28, 1875). But again the hopes and expectations of many area farmers were dashed. "A terrible hailstorm" struck at about one o'clock on the morning of June 2nd, doing "immense damage to crops, destroying orchards, hedges, etc." (Walnut Valley Times, June 11, 1875).

According to reports in the El Dorado press, "Cattle and horses were cut and gashed so that blood was trickling from their backs and sides. Chickens, prairie chickens, rabbits, quail and birds were killed in great numbers." A hailstone measuring three inches long, two inches wide and one inch thick was found after sunrise that morning. Many Chelseaites were affected by the destruction. J. M. Rayburn lost 15

acres of oats; his other crops were "somewhat injured." A. Ellis and J. S. McWhorter "suffered to a considerable extent. The grass was blown down and orchards, gardens, etc., were badly cut up."

The storm had "desolated" the "most beautiful, productive, and well cultivated" portion of Butler County. That the hailstorm was especially ill-timed was noted by the El Dorado newspaper. "The almost complete failure of crops on this same territory last season, caused by drouth and grasshoppers, makes this affliction doubly severe." Small grain crops were reported completely destroyed. The loss of fruit trees was termed "irreparable." Yet, despite such destruction, the El Dorado report ended on an optimistic note. "We feel sure," the article concluded, that "the people of this county who are more fortunate, will aid the sufferers to the extent of their means" (Walnut Valley Times, June 11, 1875).

Although the storm was a severe blow to the community, not all was lost. Corn was expected to "come again from the root" (Walnut Valley Times, June 11, 1875). J. K. Nelson informed his neighbors that the oat crop in the path of the storm would be completely recovered (Walnut Valley Times, July 16, 1875). At harvest time Nelson's projections were verified; the oats had "sprung up again from the roots" and a full crop cut. Wheat was found "generally thin on the ground," but the harvest of "the berry" and rye crops was considered good (Walnut Valley Times, July 9, 1875). Mrs. Donaldson's peach orchard was evidently spared from the storm's destruction altogether, for her trees bore several hundred bushels of fruit with which she supplied the El Dorado market (Walnut Valley Times, Aug. 13, 1875 and Sep. 3, 1875). J. E. Buchanan was able to revive his crop of "fine sweet potatoes" (Walnut Valley Times, Sep. 3, 1875).

While Chelsea's countryside emerged from the devastation of flood, drouth, 'hoppers and hailstorm, the town itself continued to contract. The "first good dwelling in Chelsea," Becker and Sadler's "fine story and a half residence," was sold to W. J. Cameron and moved to El Dorado where the new owner was later elected the city's mayor. In El Dorado the residence was considered "quite an addition" to the town (Walnut Valley Times, June 25, 1875). For the people in Chelsea the removal must have seemed an even greater loss.

Chelsea was to lose many dwellings in 1875. Some were moved, others were probably torn down for materials to be used in improvements throughout the countryside. One residence, however, suffered a more dramatic fate. At about six o'clock in the evening on a Saturday in July, Dr. Andrews' home was consumed by a fire believed to have been started from a coal previously used in lighting a pipe. The doctor, who was in Augusta at the time, lost everything including his surgical instruments. Concluding a report on the blaze the Walnut Valley Times remarked, "Let the people take warning hereafter, and, if they will indulge in the foolish habit of smoking, be careful in lighting their pipes" ("Fire in Chelsea," July 9, 1875).

What was left of Chelsea as a commercial and residential center continued. In September, 1875, a former resident wrote about Chelsea as it was and as it had been. The writer emphasized old themes but also contributed details of Chelsea's history not recorded previously. The writer additionally conveyed a sense of the hope and disappointments that summarize Chelse'a history:

Sept. 7, 1875

Editor, Walnut Valley Times:

Dear Sir:--

We remember the time when to write the news of Chelsea was a small matter compared to what it is today. Before the days of panics and grasshoppers--when Chelsea was on a "war" footing in Eldorado in the matter of (the) "county-seat," the time was too eventful to lack of matter to make up an interesting letter to your excellent paper.

Chelsea as it was and is are two very different things. We had our hopes for Chelsea--her future greatness seemed assured, though but to be county greatness.

In some respects she was great and more particularly in her moral, intelligent and enterprising people.

The stores under different proprietorships, from Chittenden to McWhorter, were models in their proprietors, stocks and keeping. Its mills were immense, though now they have dwindled to one, and it can't saw or grind "for shucks," and the "mill company have gone east."

The Chelsea School! Why, Mr. Editor, you know how proud we were of our school; our "Hinderson University," with its bell--the first in the county--each morning greeting our ears with its sweet lay of invitation, to our children, to come and shin it up the hill of knowledge, or calling us to prayers on Sabbath mornings. Miss Henderson, (now Mrs. Wilkie, of Douglas) was then principal of the school....We had jolly times too--singing schools, by Prof. Westcott, of Towanda, and an interesting lyceum participated in by the school and community. The Church and Sabbath School were not forgotten but flourished long and well. The town grew rapidly. Several babies were "the first born in the town" but at this date we don't know to whom the honor belongs. The population grew so very fast the P. M. couldn't afford, for $12 per annum, to look over <u>all</u> the letters in answer to inquiry, so we "went snucks" and had boxes made, and it's rumored now that Uncle Sam wants to charge rent on 'em.

This is not the tenth of what Chelsea was, and we have paid no attention to sequence in relating this little--'tis enough to waken memory of her past glories.

But she is changed now. I didn't know how much until I went down there the other day, to steal some peaches from the former home of Sadler and Becker. Many of her houses are removed--her gardens in weeds--her hotel empty--her stores closed. The biggest sunflower in the county, for which you offer a premium, can be picked on the "public square." We had this square plowed once and were going to have it fenced and planted in trees, and have driven ourselves into pleasurable spasms of anticipation of future happy hours to be spent under their umbrageiousness. We don't do that way now, but it's a solemn kind of fun to think how we "soared like an eagle and came down like a stick." Chelsea is now a terribly hum-drum place--'twas never quite so lively as Chicago or New York. If 'twasn't for the ring of Johnny Houser's hammer and anvil, strangers would pass the town and not know 'twas a town.

The farmers prosper, though, if the town doesn't. Providence has blessed us with an abundance-- blest all of us, and since the prosperity is general, we will not particularize.

Our "cattle upon a thousand hills," gigantic corn, enormous wheat, ponderous pumpkins and prodigious potatoes make us all glad that we did not run from G. Hopper....

Prof. Elliott, of Eldorado will have charge of the school here this winter. We predict a successful and pleasant term. There is no abatement of educational interest here and we have more, or at least as much, schoolmarm to the square foot as any township in the county.

The Times is as welcome a visitor as ever. If it is as great a success pecuniarily, to ye editor, as it is to its readers, he will prosper and grow fatter and jollier than he is.

Yours, G. G.

Chelsea changed very little from 1875 when the above letter was written, to 1879, when most of the town was vacated. John Houser's blacksmith shop remained the sole commercial enterprise. Most of the town lots were deserted and sold for unpaid taxes at prices dramatically below their initial cost. A lot that sold for forty dollars in 1870 was purchased in 1878 for a mere sixty-eight cents. An entire block selling for five hundred dollars in 1871 cost just eighty-three cents in 1880. Of little value as town lots, the land was consolidated for farmland by members of the G. T. Donaldson family, the original owners of the townsite property. In April, 1878, Mrs. E. V. Donaldson petitioned the county commission to vacate all but five blocks of the Chelsea townsite. The

few remaining residents, including John Houser, concurred with the request, and on April 9th the county commission approved the vacation (Commissioners' Journal, April 1878).

Though this brief history of the town concludes with the commission's action, Chelsea was to remain a vital force in the community for years to come. While only a fraction of its former size and population, Chelsea was yet a community center--a place to gather to attend school or church, or to celebrate an occasional wedding or a Fourth of July. This report terminates at 1878 because the vacation represents a logical cut-off point which can be used as a point of departure for continued study. The examination of Chelsea's history post 1878 is important to our understanding of a town's transition into a rural community center. Whether Chelsea remained a town after 1878 is a matter for future consideration. It is clear, however, that Chelsea remained a center of social activity well into the 20th century. The Chelsea School was operated until 1954, and the Chelsea Methodist Episcopal Church, which was not built until 1902, held religious services until 1963. Even the old Chelsea House hotel was reopened in the early years of the 20th century, but as a general store.

The history of Chelsea, Kansas, both post and prior ot 1878 is yet incomplete. Data have been collected which have not been incorporated into the texts of the Phase II and Phase III reports. By integrating these materials the Phase IV project historian can make important contributions to our understanding of Chelsea's history. By examining tax records, other sources and data previously recorded but not included in this text, it may be possible to precisely pinpoint by lot and block the location of the Chelsea House Hotel/general store and various other Chelsea buildings and business concerns.

The Phase IV historian can make additional important contributions to our understanding of the area's history by examining the efforts of two railroads to establish a new Chelsea, Kansas. South Chelsea was platted on the Kansas City, Mexico and Orient Railroad line. The Atchison, Topeka and Santa Fe Railroad also attempted to establish a new Chelsea on its line. Although it is known that town plats were drawn and several town lots sold, the brief histories of these would-be railroad towns remain an important mystery to be resolved.

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CHAPTER 8

ANALYSIS OF HISTORIC CERAMICS FROM THE EL DORADO LAKE AREA

Elizabeth Anderson

Historical archaeological excavations in the El Dorado Lake area, Butler County, Kansas, have yielded artifact assemblages which display a great deal of research potential in the field of historic ceramics. A total of seven historic sites in the lake area, which were either tested or excavated during the 1978 and 1979 seasons, contain ceramic assemblages.

While all occur within the lake area, these seven sites portray intriguing variability in their temporal, functional, and environmental settings. Ranging from the earliest log cabins built around 1857, to the later stone homes which were inhabited through the 1870s and 1880s, to the heyday of the town of Chelsea (1867-1900), there is great variability in the use dates for these sites. The sites under consideration display a continuum from the earliest pioneer log cabins through increased prosperity to stone homes and the erection of a frontier town. In addition, the sites contain functional variability from use as habitations, an ice house, and even a barn. Environmentally the sites are varied. The earliest settlements are found on the floodplain in the bottoms with subsequent habitation on higher ground.

With potential such as I have described in the El Dorado Lake area, and the fairly extensive ceramic assemblage recovered from the area, a detailed analysis of the ceramic assemblage should begin with typological identification and an evaluation of the temporal position of the types.

As one begins a search through the literature for identification and description of various historic ceramic types, certain inconsistencies and lacunae become apparent. Fontana and Greenleaf (1962) in "Johnny Ward's Ranch" proclaim that much more is known of prehistoric ceramics than historic ceramics, particularly with respect to identification of approximate time and place of manufacture. Studies of non-Indian pottery have largely been confined to the use of historic records and have been based on analyses of whole vessels and hallmarks. As a result, according to Fontana and Greenleaf, only the grossest kinds of identification can be made of these wares when one has only fragments of whole vessels with which to work.

Delving more deeply into the ceramic literature, it becomes apparent that even gross identifications are difficult to make because of the inconsistencies in ware definitions and identifications.

Earthenware, stoneware, and porcelain are generally the three main classes into which historic ceramics are divided. However, there is a distinct lack of agreement in the necessary and sufficient criteria for inclusion in each of these classes.

Charles Cheek, in his 1976 report on Honey Springs, identifies the wares as follows: earthenware is pottery with an unvitrified body; stoneware is composed of clays that can withstand high temperatures necessary to create a non-porous body even without a glaze covering; porcelain has a white translucent body that is fired to high temperatures and is completely vitrified.

Fontana and Greenleaf, in "Johnny Ward's Ranch," are more specific about ways to identify the various wares: earthenware is opaque, china is translucent; earthenware emits a dull "crockery" sound when tapped, china rings something like a wine glass. (One does not know if Fontana and Greenleaf are using the term "china" to mean porcelain only or any higher quality tableware as both definitions are found in the literature.) Earthenware must be coated with glaze to protect the porous body; true china is non-porous and is glazed only for decoration. Broken china reveals a body smooth, white and glassy, while an earthenware fracture is darker and rougher. China is usually made much thinner than earthenware, often much too thin for comfortable handling, but it is not, as many people believe, more fragile. It is strong, durable, non-porous and ideal for kitchenware.

A third opinion comes from "Anderson's Mill" (1965) where Paul Durrenberger describes the wares as follows: earthenware ceramics are distinguished most readily by the porosity of their paste (it sticks to the tongue when licked) and as a result, permeability. They absorb a relatively high volume of liquid, generally 4 to 6 percent. The paste of stoneware is harder and more compact than earthenware. It absorbs relatively little moisture (generally between 1 and 6 per cent) and will not stick to the tongue. Like the stoneware, the paste of porcelain is impermeable to liquids, absorption being less than 3 per cent. In addition, the paste is typically smooth, quite compact, white, and, especially in the case of the thinner pieces, translucent.

Porcelain as defined by these authors is the simplest group to distinguish. The division between earthenwares and stonewares is more difficult, prompting some investigators, such as Charles Cheek (1976), to call all non-porcelain white ceramics from the early 1800s "hard paste whiteware" after South (1974). For third and fourth quarter 19th century ceramic assemblages such as from the El Dorado Lake area, a grouping such as this would include an overwhelming majority of the ceramics and tell us nothing of the variability in the paste of the wares through this period.

In order to get at this problem of lack of separability for the stonewares and earthenwares, a test of porosity is possible. Earthenware has a relatively porous paste and is not fired as highly as stoneware. Stoneware is non-porous even without a glaze and is fired in a high temperature kiln to a state of vitrification. Calculating the weight gain of pieces due to the absorption of water by capillary action is a test of their relative open porosity. In order to make a test such as this, it is necessary to thoroughly remove all atmospheric water from the sherds. This can be achieved by heating the sherds to 110° celcius in an oven for a period of 24 hours. However, the common method of applying archaeological catalog numbers to specimens, namely whiteout, india ink and clear fingernail polish, will not hold up under this temperature, and so it is necessary either to map the oven and renumber all specimens or to use a second and easier method of drying. This method uses a vacuum desicator with "dri-rite" (calcium chloride) for twenty-four hours.

After the pieces are removed from the vacuum desicator (by tongs in order that no body moisture can be absorbed), they are individually weighed to a hundredth of a gram on a Mettler PC 4400 Analytical Top Loading Balance. Then each sherd is placed in water at room temperature for a period of

twenty-four hours ± 10 minutes. The sherds are removed from the water and weighed to determine their saturated weight. The percentage of weight gain or open porosity is then calculated for each piece. The expected porosity range for various paste types are available in Singer and Singer (1963) Industrial Ceramics.

Following ware identifications based on paste, it is necessary to look at decorative features of various ceramics as these usually are the most indicative of age and place of manufacture. Here, even more so than in paste identifications, there is an obvious lack of agreement on decorative type names, dates of manufacture, methods of identification and even methods of manufacture.

One example of this problem is in the flow blue ware. Most reports agree that flow blue is a transfer-printed ware. This means that the decoration is produced by an engraved metal plate inked with enamel colors and then transferred to a thin piece of paper and finally to the surface of pottery or porcelain. The colors are subsequently melted into the glaze.

According to Lynn, et al. (1977), flow blue is characterized by a dark blue glaze on a light blue background. (This is not correct as the blue is not a glaze at all; the glaze covers the dark blue decoration, which is an enamel.) The underglaze blue patterns, according to Lynn, et al. (1977), are caused to flow into the surrounding glaze by firing in an atmosphere of volatile chlorine.

Other descriptions of flow blue characterize it not as a blurry flow of the blue, but as a piece through which the blue enamel has flowed so that it is visible from the opposite side (the back) of the piece.

While both descriptions may be valid, most archaeological reports simply list so many pieces of flow blue ware with no description, so that it is unknown which criterion is being used to define the decorative technique.

While the problem with flow blue ware is with the actual decorative technique definition, decalcomania definitions present a dating discrepancy. Simply stated, decalcomania is the application of a decal to a glazed vessel. Unlike previous transfer printed wares where one was limited to monochrome, with declacomania many colors can be used with no chance of mixing and smearing. In Durrenberger's (1965) study of Anderson's Mill he states that decalcomania was developed in the mid 19th century. Roberson (1972), in his study of extinct rural communities in the United States, states that while decalcomania was well known in the 19th century it did not become popular in the U.S. until 1930. Cheek, on the other hand, reports in Honey Springs (1976) that decalcomania was invented in England in 1845 and was widely available in the U.S. in the mid-1860s.

Another inherent problem found in dealing with all historic ceramics is the habit which ceramists have of misnaming wares. Sometimes a ware was called a false name which was very similar to a hotly selling contemporary ware in order to take advantage of the buying public. Sometimes a ware was renamed with no change in the ware itself, but simply to give it a new start. A good example of this sort of mis-nomenclature is found in queensware.

In actuality, Queensware was a ware made by Josiah Wedgewood in 1765 which pleased Queen Charlotte sufficiently for her to permit it in the future to bear the name of Queen's Ware. As Queensware was a very popular cream-colored earthenware in its time, later manufacturers who were not using the same recipe for manufacture tended to call their wares queensware also. So now in the literature we find queensware still being manufactured in the 19th century and equated with pearlware (another 18th-19th century popular ware). This queensware-pearlware is obviously nothing more than an earthenware with visions of glory.

Another example of deliberate mis-nomenclature is found in the case of ironstone. The ironstone body, although an earthenware, was always described as "china" even in the patent (by Mason) and in the marks. As china normally referred to the porcelains (semi- and soft-paste included), it is likely that the inexpensive and readily available ironstone could gain buyers by referring to itself by a normally more expensive name.

In order to solve these problems and thus better analyze the ceramics from the El Dorado Lake area, an extensive search of the art history and antique collector literature was necessary. Numerous visits to museum Americana collections and antique shops solved identification problems by location of a similar piece in pristine condition. Thus, in addition to extensive paste/glaze identifications, functional type definitions were made on many pieces simply by comparison to unbroken counterparts. While the utility of this type of procedure cannot be over-emphasized, positive identifications are only the first step in the archaeologist's task.

The use of ceramic assemblages as prosperity indicators has been explored by some reports. Using a ratio of the more inexpensive wares such as earthenware to the more expensive ones such as porcelain, one can make broad suppositions as to the relative prosperity enjoyed by the inhabitants of sites. Inventories, accounts of estate sales, census records, tax documents, and probated will inventories are all areas of historic research used to back up archaeological assemblage data for a determination of occupant socio-economic status. Unfortunately, no data of this sort is available in the historic records of Butler County. We must depend entirely on the archaeological assemblage for our socio-economic data.

In this chapter, the ceramics from each of the seven historic sites under consideration will be analyzed. Particular attention will be paid to site use or function and to indications of relative prosperity.

In the tables that follow, paste/glaze names are straightforward. Paste categories are presented with glazes as subheadings. When an accepted name for a glaze was available such as albany or bristol, it was used. When no such name was available, names such as brick red, gray/green, and mottled light brown were used. Glaze types are shown on the tables with interior surface first, followed by exterior surface. Ceramic counts are given along with weights in grams, the feeling being that weight is the best indicator of mass. Ceramic functional type tables indicate the minimum number of each particular type of vessel present.

14BU1002 - *The Foster Site*

Excavations at this site centered around a wagon scale which was later used as the foundation for an ice house. The site was homesteaded in 1874 and a complete description of the site history and archaeological investigation can be found in Roberts (1979).

Table 8.1 shows a breakdown of the ceramics by paste and glaze type from the Foster site. Nine ceramic pieces and .5g brick were recovered from excavations at the wagon scale/ice house. These include four pieces of white glazed ironstone, one piece of redware, and four stoneware sherds. Functionally, these sherds represent one flowerpot, one ironstone cup, and one stoneware storage jar (see Table 8.2).

Roberts (1981) postulated that the ice house was not demolished or abandoned, but that the superstructure was relocated between 1909 and 1920. Relocation of the superstructure could help explain the small number of ceramics recovered from the site. If the structure had been abandoned but left intact, it would likely have been used as a disposal area, a common practice for abandoned structures such as an ice house. As a disposal area, a high frequency of ceramic sherds would be expected. However, only nine pieces were recovered, and this low frequency lends credence to the relocation theory.

The ceramics recovered from the ice house site could easily represent vessels broken during use as an ice house, particularly the stoneware storage pieces.

In a situation such as this, one cannot make socio-economic postulations based on presence/absence of particular wares as we are dealing with a particular use type - one geared toward utilitarian wares. In addition, no specific dates can be attached to these ceramics other than post-1813, the year Mason patented his famous ironstone. The albany glaze was used extensively throughout the 2nd half of the 19th century as a stoneware glaze.

14BU1003 - *The Marshall Site*

When acquired by the Marshall family in 1874, this site already included two log houses, stables, corrals, and a cooper. One of these log houses is still standing, and according to Roberts (1979) this house was a deliberately planned, expensively produced house with walnut paneling, an enclosed staircase, and sawmill produced timbers. "Its construction undoubtedly was meant to reflect the owners wealth and status" (Roberts 1979). For a complete treatment of the site history and archaeological excavations carried out there, see Roberts (1979).

A surface collection made at the original cabin location yielded 14 ceramic sherds (see Table 8.3). Of these sherds, seven are ironstone

Table 8.1. 14BU1002, Foster Ice House, Ceramic Paste/Glaze Types.

	T.P. 1	T.P. 4A	T.P. 4B	T.P. 5N½	T.P. 6	T.P. 7AN½	T.P. 8	Total
Earthenware/ Ironstone White glaze	1 (.3g)		2 (2.2g)	1 (.4g)				4 (2.9g)
Earthenware/ Redware		1 (.8g)						1 (.8g)
Brick				1 (.5g)				1 (.5g)
Stoneware Albany glaze/ Medium Brown glaze					1 (8.0g)			1 (8.0g)
Albany glaze/ Albany glaze					1 (3.6g)	1 (.6g)		2 (4.2g)
Albany glaze/ Red slip							1 (7.0g)	1 (7.0g)

Table 8.2. 14BU1002, Foster Ice House, Ceramic Functional Types

	T.P. 4A	T.P. 4B	T.P. 6	Total
Flowerpot	1			1
Earthenware/ Ironstone Cup		1		1
Stoneware Storage Jar			1	1

Table 8.3. 14BU1003, Marshall Cabin, Ceramic Paste/Glaze Types.

	Surface
Earthenware/Ironstone	
White glaze	7 (78.35g)
Stoneware	
Brick Red glaze/Brick Red glaze	1 (6.2g)
Albany glaze/Albany glaze	3 (51.0g)
Albany glaze/Blue/Gray Salt glaze	1 (54.1g)
Albany glaze/Gray glaze	1 (49.9g)
Albany glaze/Medium Brown glaze	1 (42.4g)

and seven are stoneware. Functionally, the vessels are quite varied, including an ironstone soup tureen, an ironstone platter, and three stoneware crocks of varying sizes (see Table 8.4). Roberts (1979) feels that the variety and number of the large pieces of crockery (stoneware) recovered may be related to the large scale production of cheese in the area at this time.

Five test pits (T.P. 1 - T.P. 5) were placed in the location of the original cabin, while 1 test pit (T.P. 6) was located on the bank of the Walnut River. These two test areas demonstrate functional and temporal variation in the ceramics recovered.

Test pits 1 - 5 yielded 24 ceramic sherds with over half representing stoneware vessels (see Table 8.5). Eleven ironstone sherds were present and 1 piece of flow blue earthenware was recovered. Functionally, the stoneware represented larger (2 and 5 gallon) crocks, while the ironstone sherds represent a plate. The flow blue sherd represents a soup plate.

Test pit 6 contained 4 sherds and 187.3g brick. One sherd was ironstone, and 1 fragment of industrial porcelain in the form of an electrical insulator was present. The remaining two pieces of earthenware are both decorated by decals and represent a soup plate and a plate (see Table 8.6). No stoneware was recovered from this test pit.

The surface collection and the first 5 test pits, all located at the original log cabin site, portray a second half of the 19th century time frame for deposition. The fragment of flow blue from this area can be considered a status piece, in keeping with the relative wealth portrayed in the structure itself. In addition, the ceramics are all typical household pieces one would expect at a log house site.

Test area 2 (T.P. 6) seems to be a much later deposition, definitely after 1900. The industrial porcelain and decalcomania both substantiate this post 1900 date.

Roberts (1979) interprets the absence of crockery (stoneware) sherds in this area as evidence that home production of cheese and other dairy products was no longer as important in the 20th century as it was in the 19th century.

This test area on a bank of the Walnut River seems to be a household dump dating from the 20th century. No status ceramics are represented - the decal earthenware was very common as well as inexpensive.

14BU1004 - Osborn Log Cabin Site

Phineas Osborn came to the Chelsea township in 1874 and built his log cabin at this site in 1874 or 1875. The cabin was not registered on the 1885 plat map; it may have been moved or burned down. See Brown (this volume) for a more complete site history and archaeological excavation data.

Table 8.4. 14BU1003, Marshall Cabin, Ceramic Functional Types.

	Surface
Earthenware/Ironstone	
Cup	1
Soup Tureen	1
Bowl	2
Platter	1
Sauce Bowl	1
Stoneware	
Bowl	2
Storage Jar	1
1 Gallon Crock	1
2 Gallon Crock	1
5 Gallon Crock	1

Table 8.5. 14BU1003, Marshall Cabin, Ceramic Paste/Glaze Types.

	T.P. 1	T.P. 2	T.P. 3	T.P. 4	T.P. 5	T.P. 6	Total
Earthenware/ Ironstone White glaze	5 (7.1g)	1 (13.7g)	1 (.7g)	2 (14.6g)	1 (.4g)	1 (.22g)	11 (36.72g)
Earthenware Flow Blue				1 (9.3g)			1 (9.3g)
Decalware						2 (35.3g)	2 (35.3g)
Stoneware Brick Red glaze/ Brick Red glaze	1 (7.0g)		1 (9.1g)				2 (16.1g)
Albany glaze/ Albany glaze		3 (10.4g)	2 (10.9g)				5 (21.3g)
Albany glaze/ Black glaze		1 (22.8g)					1 (22.8g)
Albany glaze/ Blue/Gray Salt glaze			1 (10.9g)	1 (86.0g)			2 (96.9g)
Brick Red glaze/ Yellow glaze			1 (44.2g)				1 (44.2g)
Albany glaze/ Buff glaze			2 (66.4g)				2 (66.4g)
Industrial Porcelain						1 (4.7g)	1 (4.7g)
Brick						(187.3g)	(187.3g)

Table 8.6. 14BU1003, Marshall Cabin, Ceramic Functional Types.

	T.P. 3	T.P. 4	T.P. 6	Total
Earthenware/ Ironstone				
Plate		1		1
Earthenware Flow Blue				
Soup Plate		1		1
Earthenware Decalware				
Soup Plate			1	1
Plate			1	1
Stoneware				
2 Gallon Crock	2			2
5 Gallon Crock	1	1		2
Electrical Insulator			1	1

A systematic surface collection consisting of 53 units was made at the site in order to delimit its boundaries.

The ceramics from this surface collection number 287 with 482.7g brick (see Table 8.7). Ironstone makes up the majority of the sherds, numbering 187. Eight sherds are semi-porcelain and 6 pieces are porcelain. The remaining 86 sherds are all stoneware representing 21 different paste/glaze varieties.

Eighty-seven identifiable vessels are represented by these sherds (see Table 8.8). The majority of these are ironstone vessels: plate, cup, saucer, bowl, vase, teapot lid, chamber pot, and a handle to a pitcher and bowl (wash set) (see Fig. 8.1c).

One makers mark was present on an ironstone piece: J.W. Pankhurst & Co. (see Fig. 8.2a & b). A Staffordshire pottery, Pankhurst produced from 1850-1882. "& Co." was added to their mark from c. 1852, so this piece dates between 1852 - 1882 (Godden 1964).

The six porcelain pieces at Osborn represent 5 porcelain buttons and 1 vase fragment. These porcelain buttons are all plain, white glazed, hole buttons.

Several stoneware pieces deserve mention. One stoneware marble is present (see Fig. 8.2g). It is a plain, unglazed beige marble. According to Baumann (1970), clay marbles were manufactured mainly in the last part of the 19th and the early part of the 20th centuries. One marble factory in South Akron, Ohio produced as many as 30,000 clay marbles a day.

A stoneware jug handle is also present (see Fig. 8.3a). A gray/green glaze covers the exterior and the interior is an albany glaze.

This surface collection represents a typical settler log cabin site with personal items such as buttons and a marble present, as well as household goods in the form of storage vessels and tableware.

Excavations were carried out in the area that yielded the most surface scatter. The excavated ceramics portray the same general pattern as the surface ceramics but add a few interesting pieces of data.

Here, as in the surface material, ironstone represents the largest number of sherds (see Table 8.9). These ironstone pieces represent common table vessels (see Table 8.10). Two portions of British makers marks are present (see Fig. 8.2c & d); however, both are too fragmentary to identify.

Fig. 8.1 shows three earthenware/ironstone sherds with raised designs on their exteriors. While these patterns unfortunately are not dated, the pattern names are informative as to place of manufacture.

Two porcelain pieces deserve mention - a white glaze button with

Table 8.7. 14BU1004, Osborn Log Cabin, Ceramic Paste/Glaze Types.

	General Surface	S.U. 1	S.U. 4	S.U. 6	S.U. 7	S.U. 8	Totals
Earthenware/Ironstone							
White glaze	14 (60.5g)	1 (2.4g)	1 (.9g)	2 (14.28g)		1 (1.66g)	
Semi-porcelain							
White glaze	1 (14.3g)				1 (6.9g)		
Porcelain							
White glaze	2 (2.0g)		1 (.55g)				
Brick							
Low Fired	(9.2g)					(1.3g)	
High Fired w/ Gray/Green glaze	(238.6g)						(238.6g)
Stoneware							
Albany glaze/ Albany glaze	2 (15.1g)						
Bristol glaze/ Bristol glaze	1 (5.1g)						1 (5.1g)
Brick Red glaze/ Brick Red glaze	1 (27.1g)						
Mottled Light Brown glaze/Mottled Light Brown glaze	1 (40.9g)						1 (40.9g)
Medium Brown glaze/ Gray/Green glaze	1 (15.5g)						1 (15.5g)
Albany glaze/ Unglazed				1 (9.5g)			

Table 8.7. (continued)

	S.U. 10	S.U. 11	S.U. 12	S.U. 13	S.U. 14	S.U. 15	Totals
Earthenware/ Ironstone							
White glaze	1 (2.1g)	1 (15.6g)			3 (2.0g)	3 (9.0g)	
Semi-porcelain							
White glaze						1 (1.5g)	
Brick							
Low Fired			(1.8g)	(.5g)			(12.8g)
Stoneware							
Albany glaze/ Albany glaze			1 (9.4g)		2 (9.5g)	1 (4.5g)	
Yellow glaze/ Yellow glaze				1 (5.9g)	1 (.3g)	1 (1.29g)	
Light Blue glaze/Light Blue glaze						1 (3.7g)	1 (3.7g)

Table 8.7. (continued)

	S.U. 16	S.U. 17	S.U. 18	S.U. 19	S.U. 21	S.U. 22	Totals
Earthenware/ Ironstone							
White glaze	6 (26.35g)	2 (11.6g)	5 (6.22g)	1 (.14g)	8 (10.61g)	3 (4.8g)	
Semi-porcelain							
White glaze	1 (10.0g)						
Stoneware							
Beige (unglazed)	1 (2.4g)						
Medium Brown glaze/ Unglazed	1 (31.4g)						1 (31.4g)
Albany glaze/ Gray Salt glaze	1 (48.6g)	1 (46.7g)					
Albany glaze/ Albany glaze	3 (10.58g)				2 (8.3g)		
Albany glaze/ Gray glaze	1 (35.4g)						1 (35.4g)
Medium Brown glaze/Brown Salt glaze	1 (3.9g)						

Table 8.7. (continued)

	S.U. 23	S.U. 24	S.U. 25	S.U. 26	S.U. 27	S.U. 28	Totals
Earthenware/ Ironstone							
White glaze	2 (4.9g)	17 (103.9g)	10 (30.6g)	3 (12.2g)	2 (4.1g)	1 (.15g)	
Porcelain							
White glaze		2 (1.85g)					
Stoneware							
Beige (unglazed)		1 (6.4g)					2 (8.8g)
Albany glaze/ Albany glaze	2 (29.3g)		3 (17.8g)	3 (12.7g)	2 (9.6g)		
Brick Red glaze/ Brick Red glaze	1 (10.7g)						
Albany glaze/ Light Green Salt glaze		1 (46.4g)					1 (46.4g)
Yellow glaze/ Yellow glaze		1 (1.7g)	1 (.3g)				
Albany glaze/ Unglazed		1 (8.5g)	1 (2.7g)				
Albany glaze/ Tan glaze					1 (2.1g)		

Table 8.7. (continued)

	S.U. 29	S.U. 30	S.U. 31	S.U. 32	S.U. 33	S.U. 34	Totals
Earthenware/Ironstone							
White glaze	3 (8.6g)	1 (.6g)	10 (26.6g)	13 (44.5g)	15 (49.9g)	13 (58.7g)	
Semi-porcelain							
White glaze					1 (1.4g)	1 (3.7g)	
Stoneware							
Albany glaze/ Albany glaze				4 (39.4g)	4 (30.0g)	3 (35.0g)	
Brick Red glaze/ Brick Red glaze				1 (11.6g)			3 (49.4g)
Yellow glaze/ Yellow glaze				2 (4.9g)			
Albany glaze/ Tan glaze		1 (35.1g)			1 (12.4g)		
Mottled Light Brown glaze/Albany glaze			1 (21.5g)				
Medium Brown glaze/ Gray glaze			1 (9.0g)				1 (9.0g)
Dark Gray glaze/ Dark Gray glaze			1 (3.0g)				1 (3.0g)
Bennington glaze/ Bennington glaze				1 (.34g)			
Medium Brown glaze/ Brown Salt glaze						1 (10.3g)	2 (14.2g)

Table 8.7. (continued)

	S.U. 35	S.U. 36	S.U. 37	S.U. 39	S.U. 40	S.U. 41	Totals
Earthenware/Ironstone							
White glaze	10 (31.5g)	2 (5.0g)	2 (1.5g)	1 (1.3g)	3 (6.9g)	5 (16.9g)	
Semi-porcelain							
White glaze				1 (1.84g)			
Stoneware							
Yellow glaze/ Yellow glaze			1 (.25g)		1 (9.1g)	1 (3.0g)	
Albany glaze/ Unglazed	1 (10.3g)						4 (31.0g)
Albany glaze/ Gray/Green glaze				1 (39.7g)			
Mottled Light Brown glaze/Albany glaze					1 (20.8g)	1 (12.2g)	3 (54.5g)
Albany glaze/ Gray Salt glaze						1 (47.7g)	3 (143.0g)
Albany glaze/ Albany glaze						3 (23.1g)	

Table 8.7. (continued)

	S.U. 42	S.U. 43	S.U. 44	S.U. 45	S.U. 46	Totals
Earthenware/Ironstone						
White glaze	6 (19.5g)	3 (5.43g)	3 (7.8g)	1 (4.1g)	2 (7.26g)	
Semi-porcelain						
White glaze		1 (2.9g)				8 (42.54g)
Porcelain						
White glaze	1 (.09g)					6 (4.49g)
Stoneware						
Albany glaze/ Gray/Green glaze				1 (5.3g)	1 (5.2g)	
Yellow glaze/ Yellow glaze	2 (10.3g)					12 (37.04g)
Albany glaze/ Albany glaze			1 (9.6g)			
Bennington glaze/ Bennington glaze	1 (5.3g)					2 (5.64g)
Medium Brown glaze/ Light brown glaze			1 (4.9g)			1 (4.9g)
Albany glaze/ Tan glaze				1 (20.2g)		4 (69.8g)

Table 8.7. (continued)

	S.U. 47	S.U. 48	S.U. 49	S.U. 50	S.U. 52	Totals
Earthenware/Ironstone						
White glaze		3 (19.5g)	1 (3.2g)	3 (17.6g)		187 (660.40g)
Brick						
High Fired with glazed surface	1 (89.3g)				1 (142.0g)	2 (231.3g)
Stoneware						
Albany glaze/ Gray/Green glaze		1 (64.5g)				4 (114.7g)
Albany glaze/ Albany glaze		1 (2.8g)				37 (266.68g)

Table 8.8. 14BU1004, Osborn Log Cabin, Ceramic Functional Types.

	General Surface	SU 1	SU 4	SU 6	SU 8	SU 11	SU 15	SU 16	SU 17	SU 18	Totals
Earthenware/ Ironstone											
Cup	1	1					1	1	1		
Plate	6			1				1			
Saucer					1					1	
Handle to a Pitcher and Bowl Set (Wash Set)						1					1
Semi-porcelain White glaze											
Bowl	1										
Porcelain White glaze											
Button	2		1								
Stoneware											
Bowl	2			1							
1 Gallon crock	1							1			2
2 Gallon crock								1			
Crock								1			
Marble								1			1
5 or 6 Gallon crock									1		1

Table 8.8. (continued)

	SU 21	SU 22	SU 23	SU 24	SU 25	SU 26	SU 29	SU 30	SU 31	SU 32	SU 33	Totals
Earthenware/ Ironstone												
Plate	1			2		1			2			
Cup	1			2	1		1			1	2	
Saucer					1						2	
Chamber pot		1										1
Bowl				1						1	2	
Vase				1								
Porcelain												
White glaze Button				1								
Vase				1								1
Stoneware												
Bowl			2	1	1							
Crock								1				
2 Gallon crock				1								2
2 or 3 Gallon crock											1	
Tobacco pipe									1			1
Plate				1								1

Table 8.8. (continued)

	SU 34	SU 35	SU 39	SU 41	SU 42	SU 43	SU 46	SU 48	SU 49	SU 50	Totals
Earthenware/ Ironstone											
Plate	2			1	1	1					19
Cup	1	1	1	1					1	1	19
Saucer		1					1				7
Bowl	1										5
Vase	1										2
Teapot Lid	1										1
Semi-porcelain											
Cup			1								1
Bowl						1					2
Porcelain											
Button					1						5
Stoneware											
Bowl		1									8
Crock			1	1				1			5
2 or 3 Gallon crock	1										2

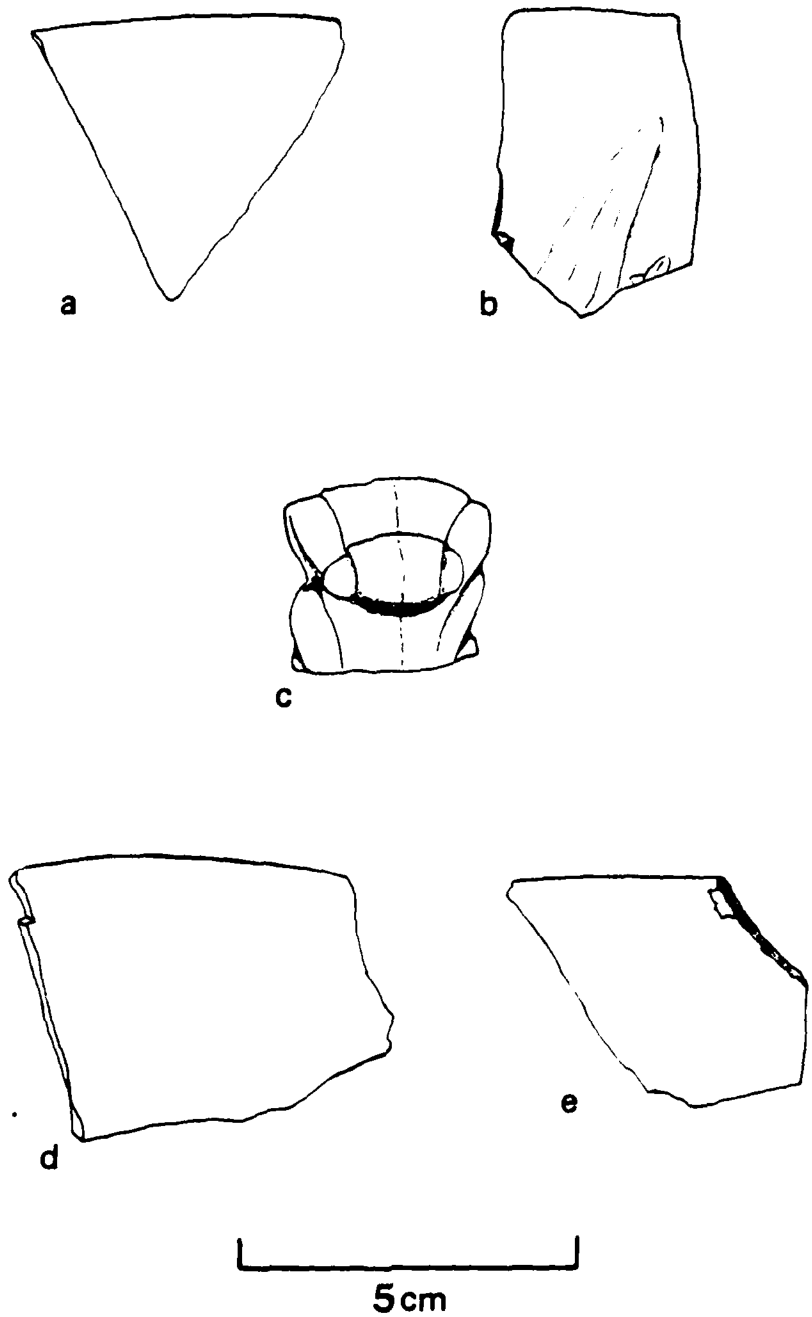

Figure 8.1. Raised Designs. a. Ironstone cup in Corn n' Oats pattern; b. Semi-porcelain bowl with unidentified pattern; c. Ironstone handle to a pitcher and bowl (wash set); d. Ironstone plate in Bedford pattern; e. Ironstone cup with unidentified pattern.

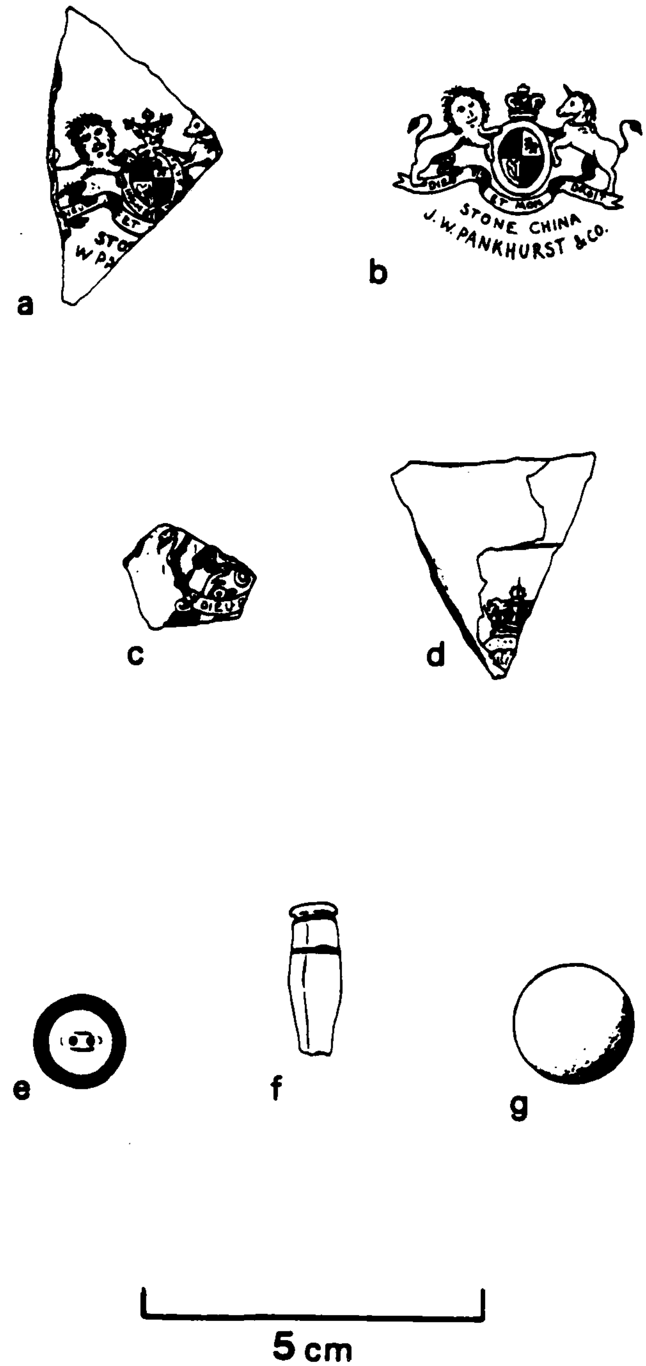

Figure 8.2. Makers' marks and miscellaneous. a. J.W. Pankhurst mark as recovered; b. J.W. Pankhurst mark reconstructed; c. Ironstone piece with coat of arms portion; d. Ironstone piece with coat of arms portion; e. Porcelain hole button with blue ringer and fish eye center; f. Porcelain doll leg with pink hand painted garter; g. Stoneware marble.

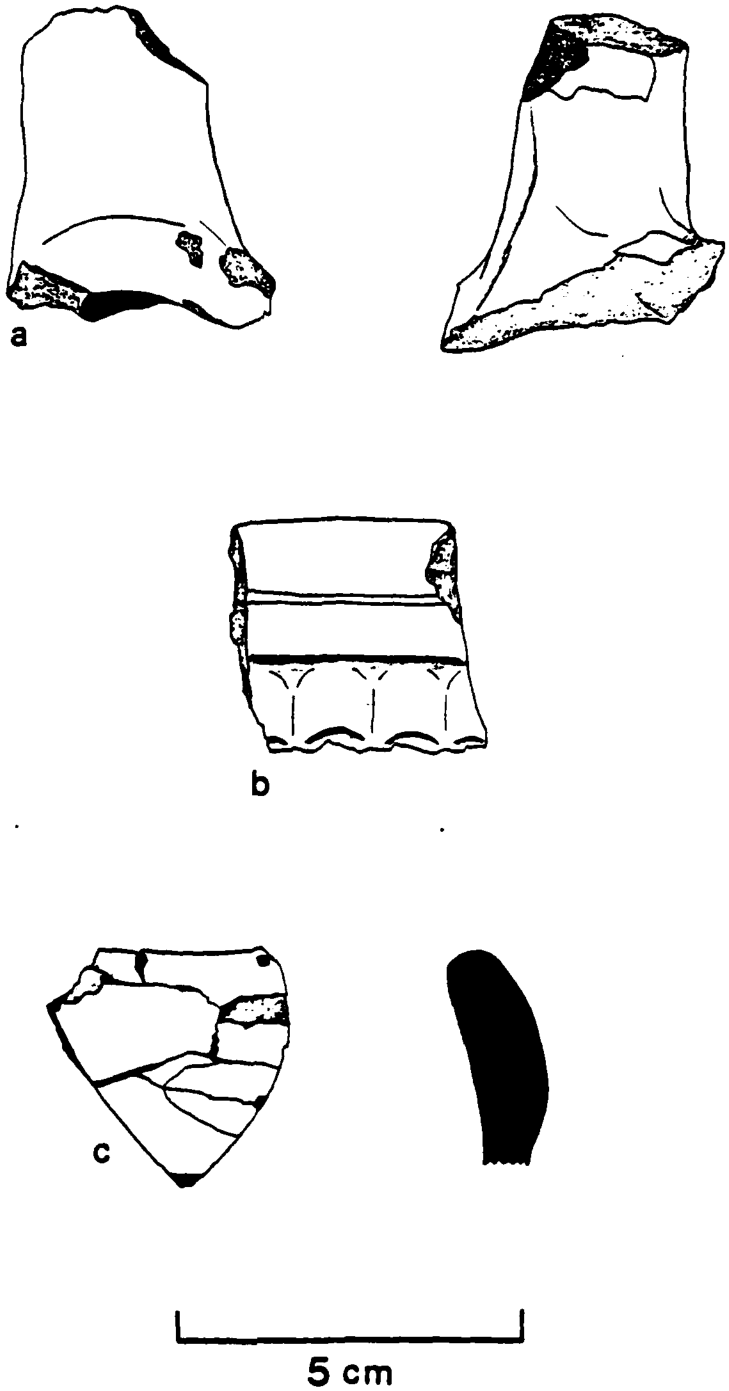

Figure 8.3. Stoneware. a. Jug handle--Albany/Gray/Green glazes; b. Mixing bowl--Yellow/Yellow glaze; c. Bowl--Brown (Bennington) glaze.

Table 8.9. 14BU1004, Osborn Log Cabin, Ceramic Paste/Glaze Types.

	XU 1	XU 2	XU 3	XU 4	XU 5	Totals
Earthenware/Ironstone						
White glaze	17 (16.26g)	10 (19.3g)	13 (15.8g)	9 (9.98g)	14 (23.5g)	
Semi-porcelain						
White glaze				3 (4.65g)		
Clay						
White (unglazed)			1 (1.6g)			
Yellow/Brown (unglazed)				1 (3.8g)		1 (3.8g)
Brick						
Low Fired	(34.8g)	(12.6g)	(3.0g)	(11.5g)	(1.0g)	
High Fired	(4.7g)		(89.0g)		(96.0g)	
Stoneware						
Albany glaze/ Albany glaze	1 (3.8g)		1 (.82g)			
Mottled Light Brown glaze/Albany glaze	1 (8.3g)					
Tan glaze/Tan glaze	1 (1.52g)					1 (1.52g)
Yellow glaze/ Yellow glaze	1 (.58g)		1 (4.9g)		1 (8.2g)	
Medium Brown glaze/ Gray/Green glaze			1 (8.8g)			
Bennington glaze/ Bennington glaze				1 (2.8g)		
Brick Red glaze/ Brick Red glaze					1 (10.2g)	

Table 8.9. (continued)

	XU 6	XU 7	XU 8	XU 9	XU 10	Totals
Earthenware/Ironstone						
White glaze	17 (19.9g)	25 (52.7g)	26 (36.95g)	32 (36.18g)	26 (38.89g)	
Semi-porcelain						
White glaze			1 (5.6g)	1 (1.82g)		
Porcelain						
White glaze	3 (1.56g)		2 (5.9g)		2 (2.2g)	
Brick						
Low Fired	(4.8g)	(5.5g)	(13.4g)	(14.0g)	(9.0g)	
High Fired	(12.0g)		(5.7g)	(31.0g)	(6.0g)	
Clay						
White (unglazed)	1 (6.1g)					
Stoneware						
Albany glaze/ Albany glaze	4 (54.5g)		1 (15.9g)	3 (18.07g)		
Mottled Light Brown glaze/Albany glaze		1 (15.9g)	1 (19.7g)		1 (9.4g)	
Yellow glaze/ Yellow glaze	3 (9.2g)	8 (18.09g)	2 (1.28g)		3 (3.66g)	
Medium Brown glaze/ Gray/Breen glaze			2 (31.sg)			
Bennington glaze/ Bennington glaze	2 (1.55g)	1 (13.0g)		1 (.52g)	1 (2.8g)	
Brick Red glaze/ Brick Red glaze	1 (1.37g)		2 (13.8g)	1 (12.0g)		
Albany glaze/ Yellow/Brown glaze	1 (10.1g)	1 (5.0g)				2 (15.1g)
Gray/Green glaze/ Gray/Green glaze	1 (0.7g)					1 (0.7g)
Medium Brown glaze/ Unglazed			1 (7.1g)	1 (13.6g)		2 (20.7g)

Table 8.9. (continued)

	XU9 (cont'd)	XU 10 (cont'd)	XU 11	XU 12	XU 13	Totals
Earthenware/Ironstone						
White glaze			23 (20.2g)	12 (16.43g)	6 (28.68g)	
Semi-porcelain						
White glaze			1 (.44g)			
Porcelain						
White glaze				1 (1.1g)		
Brick						
Low Fired			(27.5g)	(21.6g)	(4.2g)	
High Fired				(12.5g)	(8.5g)	
Stoneware						
Albany glaze/ Gray glaze	1 (53.6g)					
Medium Brown glaze/ Brown Salt glaze		1 (4.0g)				
Albany glaze/ Albany glaze			2 (22.1g)	2 (5.82g)	1 (2.1g)	
Yellow glaze/ Yellow glaze			2 (2.22g)	1 (2.7g)		
Medium Brown glaze/ Gray/Green glaze				1 (6.2g)		4 (46.2g)
Bennington glaze/ Bennington glaze				1 (7.9g)		7 (28.57g)
Albany glaze/ Medium Brown glaze				1 (8.1g)		
White (unglazed)				1 (5.8g)		1 (5.8g)

Table 8.9. (continued)

	XU 14	XU 15	XU 16	XU 17	XU 18	Totals
Earthenware/Ironstone						
White glaze	9 (9.89g)	8 (17.27g)	1 (.34g)	2 (4.94g)	3 (1.58g)	
Semi-porcelain						
White glaze		1 (1.7g)				
Brick						
Low Fired	(23.6g)	(5.0g)	(4.5g)	(.5g)	(3.0g)	
High Fired	(112.0g)					
Stoneware						
Albany glaze/ Albany glaze	2 (10.54g)			1 (3.0g)	1 (11.9g)	
Mottled Light Brown glaze/Albany glaze			1 (9.5g)			
Yellow glaze/ Yellow glaze	1 (.78g)	1 (.65g)	1 (.29g)	1 (.35g)		
Brick Red glaze/ Brick Red glaze	1 (2.7g)					6 (40.07g)
Albany glaze/ Medium Brown glaze	1 (4.1g)					2 (12.2g)
Albany glaze/ Tan glaze	1 (59.2g)					1 (59.2g)

Table 8.9. (continued)

	XU 19	XU 20	XU 21	XU 22	XU 23	Totals
Earthenware/Ironstone						
White glaze	2 (8.73g)		17 (32.86g)	12 (39.g)	27 (38.49g)	
Porcelain						
White glaze				1 (.7g)		
Brick						
Low Fired			(11.5g)	(2.0g)	(9.2g)	
High Fired				(35.0g)		
Stoneware						
Albany glaze/ Albany glaze	1 (5.4g)	1 (3.5g)	1 (3.3g)	2 (10.5g)	1 (4.2g)	
Yellow glaze/ Yellow glaze		1 (.92g)			1 (2.7g)	
Mottled Light Brown glaze/Albany glaze			1 (10.5g)	1 (24.7g)	1 (9.6g)	8 (107.6g)
Medium Brown glaze/ Brown Salt glaze					1 (17.5g)	2 (21.5g)
Albany glaze/ Gray Salt glaze					1 (61.6g)	1 (61.6g)
Clay						
White (unglazed)					1 (5.3g)	3 (13.0g)

Table 8.9. (continued)

	XU 24	XU 25	XU 26	XU 27	Totals
Earthenware/Ironstone					
White glaze	15 (86.92g)	12 (19.37g)	5 (21.36g)	12 (18.86g)	355 (634.38g)
Semi-porcelain					
White glaze	2 (11.38g)				9 (25.59g)
Porcelain					
White glaze			1 (.66g)		10 (12.12g)
Brick					
Low Fired	(7.3g)	(10.0g)	(24.2g)	(3.0g)	(266.7g)
High Fired		(8.4g)			(420.8g)
Stoneware					
Albany glaze/ Albany glaze	1 (4.0g)	6 (26.69g)	3 (15.9g)	3 (10.3g)	38 (232.34g)
Yellow glaze/ Yellow glaze		1 (14.9g)		1 (1.66g)	30 (73.08g)
Albany glaze/Gray glaze		2 (155.0g)			3 (208.6g)
Light Brown glaze/ Light Brown glaze		1 (.56g)			1 (.56g)
Gray (unglazed)	3 (56.6g)			1 (5.8g)	4 (62.4g)
Clay					
Brown (unglazed)		1 (8.4g)			1 (8.4g)

Table 8.10. 14BU1004, Osborn Log Cabin, Ceramic Functional Types.

	XU 1	XU 2	XU 3	XU 4	XU 5	XU 6	XU 7	XU 8	Totals
Eartnehware/Ironstone									
Plate		1		1	2	2	2		
Cup		1	1				3	3	
Small Bowl					1				1
Saucer					1				
Porcelain									
White glaze Button						3			
Cup								1	1
Semi-porcelain									
White glaze									
Sugar Bowl								1	1
Stoneware									
Crock						1			1
Bowl							1		1
Tobacco Pipe									
Stem	1		1			1			
Bowl				1		1			2

Table 8.10. (continued)

	XU 9	XU 10	XU 11	XU 12	XU 13	XU 14	XU 15	XU 19	Totals
Earthenware/Ironstone									
White glaze Plate	1	2							
Cup	3	1	1	1	1			1	
Saucer					1		1		3
Bowl						1			
Semi-porcelain									
White glaze cup	1								1
Porcelain									
White glaze Button		1		1					
Doll Leg		1							1
Stoneware									
Plate				1					1
1 Gallon crock			1						1
3 or 4 Gallon crock						1			
5 or 6 Gallon crock	1								
Doorknob		1							1

Table 8.10. (continued)

	XU 21	XU 22	XU 23	XU 24	XU 25	XU 26	XU 27	Totals
Earthenware/Ironstone								
White glaze Cup	1	1		3	3	1	3	28
Plate		2		1				14
Bowl			1	1				3
Sugar Bowl						1		1
Semi-porcelain								
White glaze Bowl				1				1
Porcelain								
White glaze Button						1		6
Stoneware								
Cup							1	1
Mixing Bowl					1			1
Ink Bottle				1				1
3 or 4 Gallon crock			1					2
5 or 6 Gallon crock					2			3
Clay								
Tobacco Pipe Stem			1		1			5

a blue ring - a ringer (see Fig. 8.2e), and a doll leg with a hand painted (pink) garter (see Fig. 8.2f).

The stoneware pieces present display the expected glazes and represent crocks, bowls, and a wide based cone type ink bottle. This type of ink bottle was made in the latter half of the 19th century in both England and the United States (see Fig. 8.4a & b).

However, probably the most interesting ceramic artifacts from Osborn are seven tobacco pipe fragments (see Fig. 8.5a - f). These molded, clay pipes were manufactured throughout the latter half of the 19th century and the 1st quarter of the 20th century. All are plain except one which has a fish scale design on the stem (see Fig. 8.5e).

The ceramics from the Osborn Log Cabin site reveal a frontier family engaged in homemaking and perhaps dairying and cheese production. They wore plain buttons on their clothes, smoked simple clay pipes, played with simple clay marbles and ate from plain ironstone, A daughter, perhaps, had one of their finest pieces - a porcelain doll. In general, these ceramics display a frontier life at Osborn Log Cabin with few frills and a relatively low economic status.

<u>*14BU1005 - Doc Lewellen Site*</u>

While three houses are connected with the Lewellen site, the archaeological investigations concentrated on the stone cabin, the second of the three houses. Built 1873 - 1874, the cabin is of limestone and was considered a high status building when constructed. For a complete description of the cabin and the archaeological investigations carried out there, see Roberts (1979).

A surface collection consisting of 34 pieces was recovered from the Lewellen site. The majority of these are stoneware (see Table 8.11) crocks with capacity from 1 gallon - 10 gallons (see Table 8.12).

Two areas were chosen for subsurface testing. Test area 1 consisted of T.P. 1 - T.P. 8 and T.P. 16 - T.P. 24 and was located at the stone house site. Test area 2 was located at the nearby contemporary barn and consisted of T.P. 10 - T.P. 15.

There is a striking difference between these two areas in the ceramic assemblages recovered. The house area contained 35 sherds and 26.9g brick, while the barn area contained only 2 sherds (see Table 8.13). As the Kobel Barn, 14BU1006, also contained a very small number of ceramic sherds, this suggests that the quantity of ceramics may be a key trait in distinguishing habitational and barn sites excavated in the future.

The majority of the ceramics excavated at the Lewellen site are ironstone with basic table pieces such as plates, cup, and bowl present.

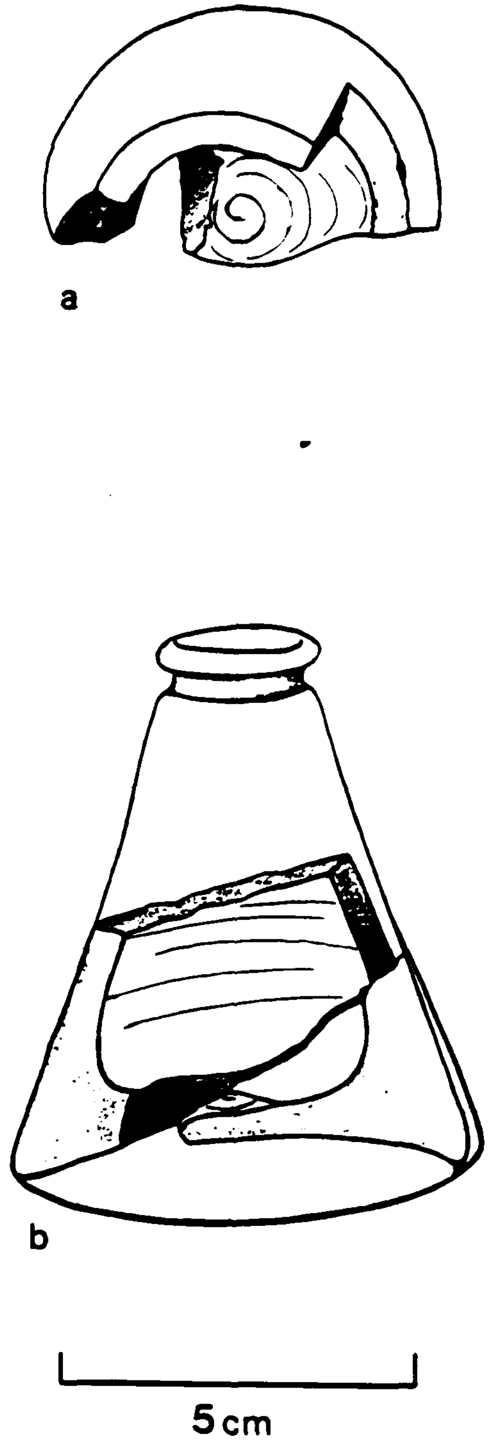

Figure 8.4. Ink Bottle. a. Gray (unglazed) wide base cone type ink bottle top view; b. Reconstructed ink bottle.

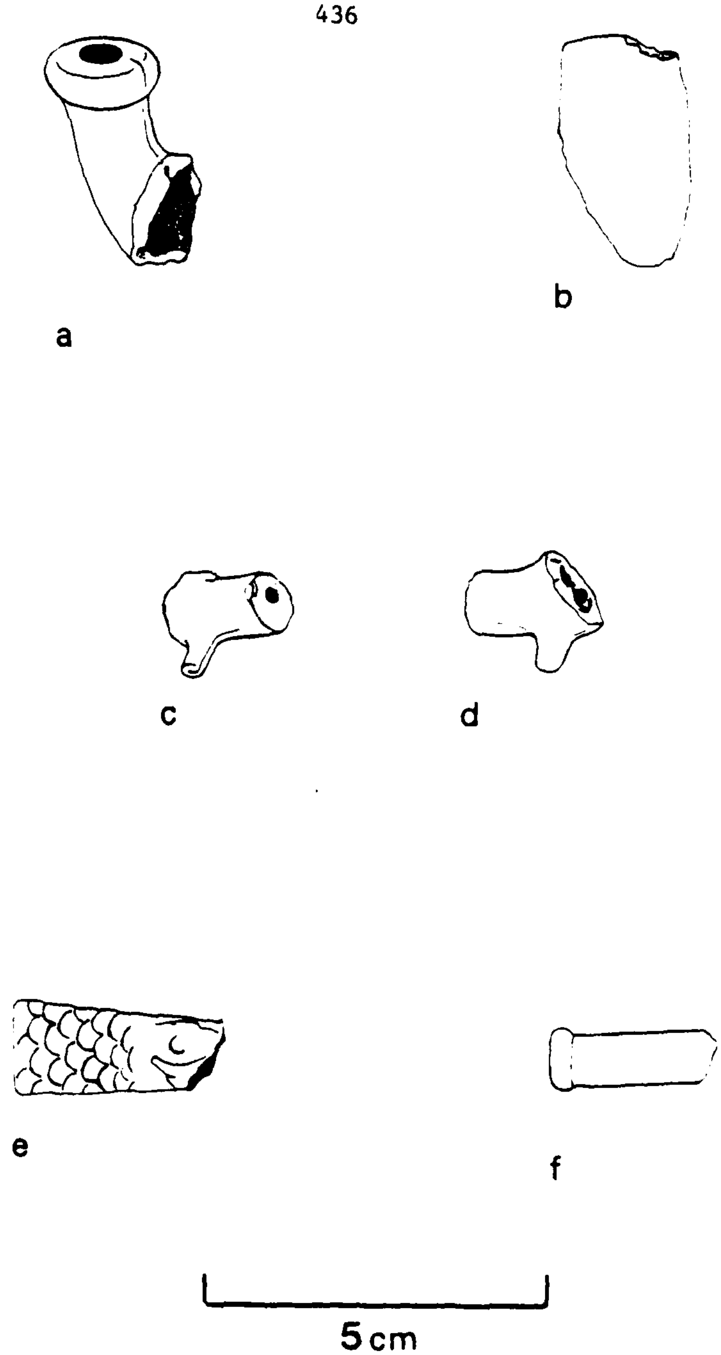

Figure 8.5. Tobacco Pipe Fragments. a. Yellow/Brown (unglazed) molded pipe stem; b. Yellow/Brown (unglazed) pipe bowl fragment (matches a); c. and d. White (unglazed) pipe stem with unmarked spur; e. White (unglazed) molded pipe stem with fish scale design; f. White (unglazed) molded pipe stem (matches c and d).

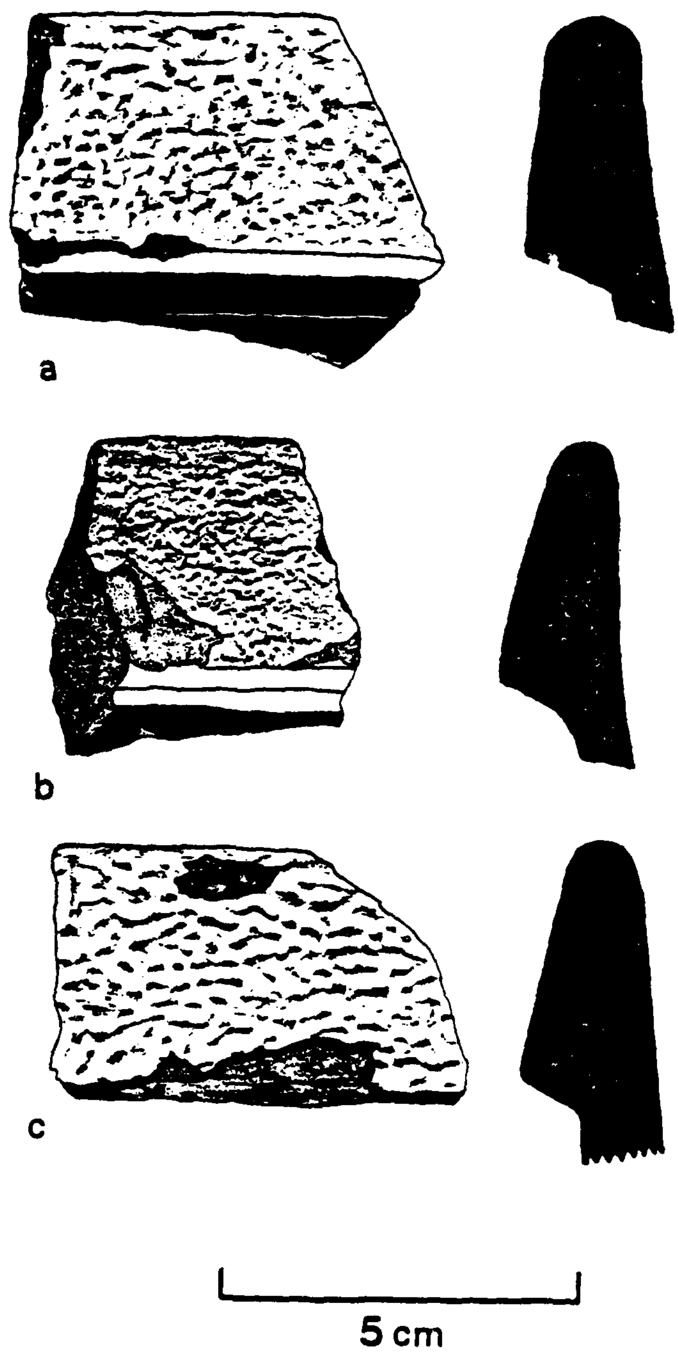

Figure 8.6. Stoneware Crocks. a. 3 or 4 gallon crock with Albany/Gray Salt glaze (rim) Albany (body); b. Crock with Albany/C··ay/ Green glaze; c. 2 gallon crock with Albany/Light Green Salt glaze.

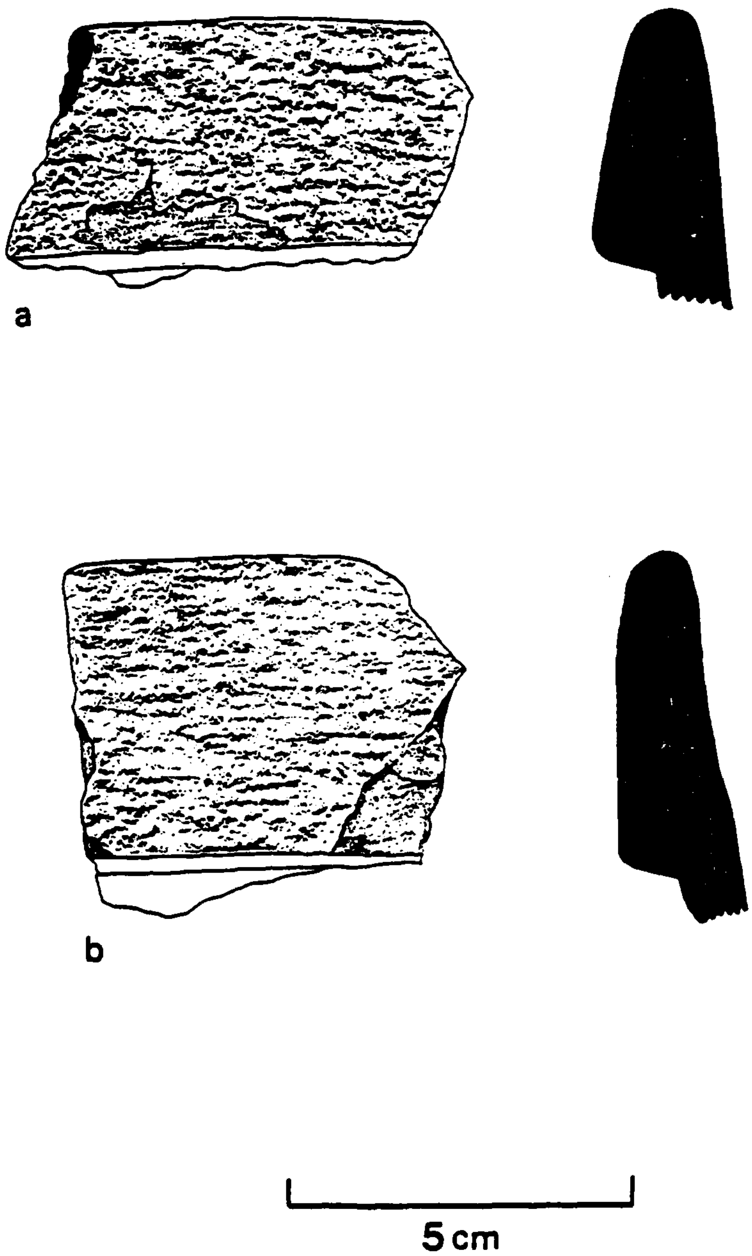

Figure 8.7. Stoneware Crocks. a. 5 or 6 gallon crock with Albany/Gray glaze; b. 3 or 4 gallon crock with Albany/Tan glaze.

Table 8.11. 14BU1005, Lewellen Stone House, Ceramic Paste/Glaze Types.

	Surface
Earthenware/Ironstone	
White glaze	5 (33.11g)
Semi-porcelain	
White glaze	4 (18.34g)
Stoneware	
Albany glaze/Albany glaze	5 (409.1g)
Albany glaze/Gray glaze	1 (16.8g)
Albany glaze/Light Brown glaze	1 (10.3g)
Albany glaze/Brick Red glaze	1 (42.8g)
Albany glaze/Yellow/Brown glaze	1 (82.2g)
Albany glaze/Gray Salt glaze	1 (70.1g)
Bristol glaze/Bristol glaze	13 (1148.4g)
Unglazed/Bristol glaze	2 (43.3g)

Table 8.12. 14BU1005, Lewellen Stone House, Ceramic Functional Types.

		Surface
Earthenware/Ironstone Cup		2
Earthenware/Ironstone Pitcher		1
Stoneware:	1 Gallon crock	2
	2 Gallon crock	2
	3 Gallon crock	3
	6 Gallon crock	1
	10 Gallon crock	1

Table 8.13. 14BU1005, Lewellen Stone House, Ceramic Paste/Glaze Types.

	T.P. 1	T.P. 2	T.P. 3	T.P. 4	T.P. 5	T.P. 6	T.P. 7	Total
Earthenware/Ironstone								
White glaze	2 (2.5g)		1 (2.8g)	1 (2.8g)	4 (8.1g)	1 (9.0g)	1 (1.1g)	
Semi-porcelain								
White glaze		1 (1.5g)					1 (8.3g)	
Stoneware								
Albany glaze/ Tan glaze		1 (2.2g)	1 (11.9g)					2 (14.1g)
Yellow glaze/ Yellow glaze			1 (1.2g)					1 (1.2g)
Burnt Orange glaze/ Albany glaze			1 (2.8g)					1 (2.8g)
Burnt Orange glaze/ Medium Brown glaze					1 (5.2g)			1 (5.2g)
Albany glaze/ Yellow/Brown glaze					1 (23.6g)			1 (23.6g)
Burnt Orange glaze/ Burnt Orange glaze							1 (2.7g)	1 (2.7g)
Olive Green glaze/ Olive Green glaze							1 (16.3g)	1 (16.3g)

Table 8.13. (continued)

	T.P.13	T.P.14	T.P.15	T.P.17	T.P.19	T.P.20	T.P.21	T.P.22	T.P.23	T.P.24	Total
Earthenware/											
Ironstone											
White glaze				1(1.2g)	2(5.1g)	2(2.6g)		1(2.3g)	3(6.6g)	3(4.4g)	22(48.5g)
Semi-porcelain											
White glaze						1(0.7g)					3(10.5g)
Stoneware											
Albany glaze/											
Albany glaze	1(3.3g)	1(1.8g)								1(3.5g)	3(8.6g)
Albany glaze/											
Gray glaze									1(15.7g)		1(15.7g)
Brick							(26.9g)				(26.9g)

Stoneware vessels include bowls, jugs, and a crock (see Table 8.14). These items are what would be expected from a 4th quarter of the 19th century frontier dwelling.

Although the Lewellen family was financially well off, there are no status pieces in the ceramic assemblage to indicate this status. The lack of such items in the archaeological record could be explained by their careful curation by the family if they existed at all and/or by the realization that the stone cabin was occupied for a relatively brief period: 1874-1885.

14BU1006 - The Kobel Site

The Kobel barn was built in 1871 and is a style known as the Pennsylvania-German bank barn. For a complete description of the barn architecture and the excavation procedures, see Roberts (1979).

The ceramic assemblage from the Kobel barn consists of three albany glazed sherds. No specific functional types can be identified from them; however, it is possible that these represent vessels connected with dairying (see Table 8.15). As mentioned at the Lewellen barn, the scarcity of ceramic artifacts at these two barns can be expanded to a key trait in distinguishing barn sites archaeologically.

14BU1007 - New Chelsea Site

The town known as New Chelsea was granted a charter in 1870 and had already ceased to exist by the turn of the 20th century. For a complete description of the town and the archaeology carried out there, see Roberts (1979).

A surface collection from the town area (see Table 8.16) yielded the usual stoneware and had a majority of ironstone, but another fact is immediately obvious - the wares have increased variety in paste (i.e. semi-porcelain) and decoration (i.e. blue willow). Functionally, the surface artifacts are also more varied (see Table 8.17).

Of particular note is a cylindrical, wheel-thrown stoneware ink bottle with a brown salt glaze (see Fig. 8.8a). Impressed with: "Vitreous Stone Bottles/ J.Bourne and Son,/Patentees/Denby and Codner Park Potteries/ P. & J. Arnold/London." P. & J. Arnold produced quality duplicating and writing inks in several colors between 1724 and 1950.

Excavations at New Chelsea reveal yet more variety with blue transfer printed wares present (see Table 8.18) and a clay pipe stem (see Fig. 8.8b).

The ceramics from New Chelsea portray household goods as one would expect in a frontier town. The wares are varied, demonstrating a variety of personal tastes.

Table 8.14 14BU1005, Lewellen Stone House, Ceramic Functional Types

	T.P. 3	T.P. 5	T.P. 6	T.P. 7	T.P. 19	T.P. 20	T.P. 23	T.P. 24	Total
Earthenware/ Ironstone									
Plate					1		1	1	3
Cup							1		1
Bowl			1						1
Semi-Porcelain									
Bowl				1					1
Doll						1			1
Stoneware									
Bowl		1					1		2
Jug		1	1						2
Crock	1								1
Mixing Cup	1								1

Table 8.15 14BU1006 Kobel Barn Ceramic Paste/Glaze Types

	T.P. 1	T.P. 4	Total
Stoneware Albany glaze/ Albany glaze	1 (11.4g)	2 (13.2g)	3 (24.6g)

Table 8.16 14BU1007, New Chelsea, Ceramic Paste/Glaze Types

	Surface
Earthenware/Ironstone	
White Glaze	32 (155.94g)
Earthenware	
Blue Willow	1 (2.7g)
Semi-porcelain	
White Glaze	14 (70.93g)
Porcelain	1 (28.9g)
Brick	
High Fired	(104.8g)
Low Fired	(95.3g)
Stoneware	
Medium Brown glaze Transparent Slip (Spatterware)	4 (160.4g)
Medium Brown glaze/ Gray Salt glaze	1 (16.3g)
Albany glaze/ Gray glaze	2 (15.2g)
Albany glaze/ Albany glaze	3 (29.9g)
Clay Orange/ Clay Orange (Unglazed)	1 (48.1g)
Burnt Orange glaze/ Burnt Orange glaze	1 (3.6g)
Brick Red glaze/ Brick Red glaze	1 (30.5g)
Albany glaze/ Gray/Green glaze	1 (19.6g)
Albany glaze/ Medium Brown glaze	1 (32.1g)
Medium Brown glaze/ Transparent Slip	3 (153.4g)
Unglazed/Light Brown glaze	1 (28.0g)

Table 8.16 (Continued)

	Surface
Stoneware	
Medium Brown glaze/ Medium Brown glaze	1 (36.5g)
Medium Brown glaze/ Light Green Salt glaze	1 (34.5g)
Gray/Green glaze/ Gray/Green glaze	1 (0.2g)
Albany glaze/ Tan glaze	1 (79.0g)
White/unglazed (Marble)	1 (2.9g)

Table 8.17 14BU1007, New Chelsea, Ceramic Functional Types

	Surface
Earthenware/ Ironstone	
Saucer	2
Cup	4
Plate	6
Chamber Pot	1
Earthenware Blue Willow	
Cup	1
Semi-porcelain	
Cup	4
Bowl	2
Toiletry Set Handle	1
Porcelain Doorknob	1
Stoneware	
Ink Bottle	1
Marble	1
Crock	2
5 Gallon Crock	1
6 Gallon Crock	1
Bowl	3
Pipe Bowl	1

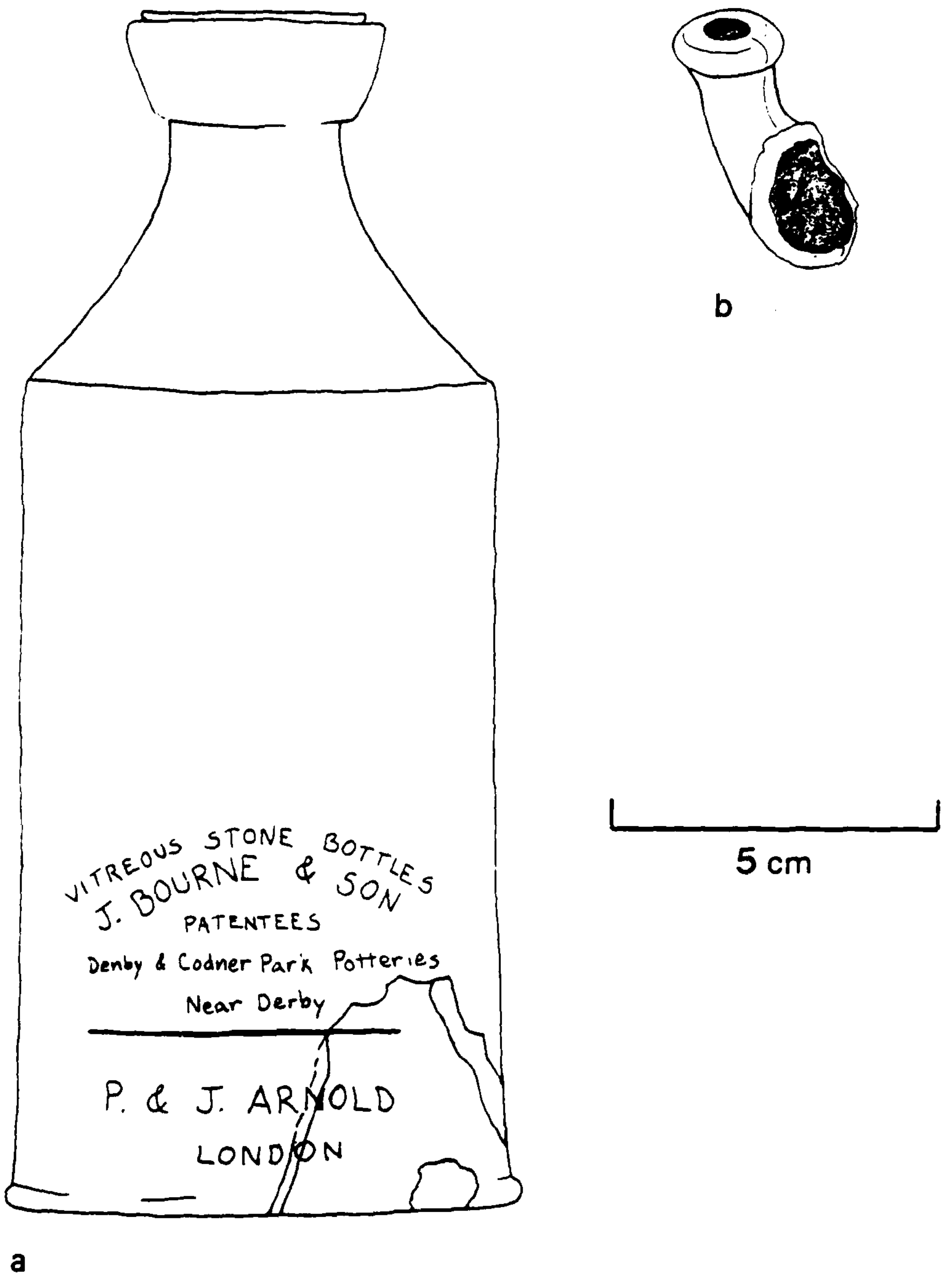

Figure 8.8. New Chelsea Ceramics. a. Brown salt glazed, cylindrical, wheel-thrown stoneware ink bottl ; b. Yellow/Brown glazed and molded tobacco pipe stem.

Table 8.18 14BU1007, New Chelsea, Ceramic Paste/Glaze Types

	T.P. 1	T.P. 2	T.P. 3	T.P. 4	Total
Earthenware/ Ironstone White glaze		1 (.94g)	5 (2.1g)		
Earthenware Blue Transfer Printed ware	1 (.56g)				1 (.56g)
Semi-procelain White glaze			1 (1.2g)		
Stoneware					
Albany glaze/ Albany glaze	2 (31.2g)				
Brick Red glaze/ Brick Red glaze		2 (11.0g)	1 (.31g)	1 (3.6g)	4 (14.91g)
Medium Brown glaze/ Medium Brown glaze		1 (11.7g)	1 (11.8g)		2 (23.5g)
Yellow glaze/ Yellow glaze		1 (.65g)	1 (6.5g)		2 (7.15g)
Medium Brown glaze/ Albany glaze		1 (2.0g)			
Albany glaze/ Bristol glaze			3 (3.57g)		

Table 8.18 (Continued)

	T.P. 5	T.P. 6	T.P. 7	T.P. 8	Total
Earthenware/					
Ironstone					
White glaze	3 (1.2g)	1 (11.8g)		2 (2.26g)	
Semi-porcelain					
White glaze			1 (.59g)		
Stoneware					
Albany glaze/ Albany glaze			1 (10.0g)	2 (12.4g)	
Medium Brown glaze/ Albany glaze			2 (10.5g)		3 (12.5g)
Albany glaze/ Bristol glaze			1 (5.8g)		4 (9.37g)
Yellow/unglazed	1 (8.8g)				1 (8.8g)
Bristol glaze/ Bristol glaze			1 (1.14g)	1 (5.0g)	2 (6._4g)
White glaze/ Brown glaze with turquoise blue and yellow bands		1 (3.0g)			1 (3.0g)
Brick	(2.8g)				(2.8g)

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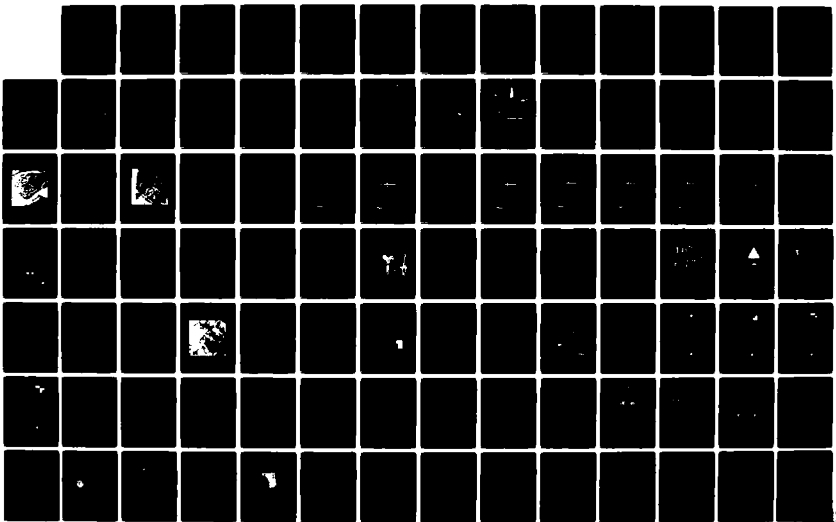

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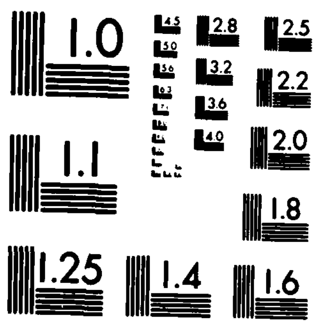

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Table 8.18 (Continued)

	XU 106	XU 107	XU 138	XU 152	XU 168	XU 177	Total
Earthenware/ Ironstone							
White glaze		1 (.9g)	1 (5.7g)		1 (.67g)		
Stoneware							
Albany glaze/ Albany glaze	1 (1.8g)						6 55.4g)
Albany glaze/ Tan glaze						1 (86.7g)	1 (86.7g)
Yellow Brown glaze/ Yellow Brown glaze				1 (10.4g)			1 (10.4g)

Table 8.18 (Continued)

	XU 186	XU 189	XU 197	XU 198	XU 201	Total
Earthenware/ Ironstone White glaze			1 (1.02g)	1 (.3g)		17 (26.89g)
Earthenware Yellow/unglazed		1 (.91g)				1 (.91g)
Earthenware White/unglazed					1 (2.5g)	1 (2.5g)
Semi-porcelain White glaze	1 (.5g)					3 (2.29g)

Table 8.19 14BU1007, New Chelsea, Ceramic Functional Types

	T.P. 1	T.P. 6	XU 152	XU 177	XU 186	XU 189	XU 201	Total
Earthenware/ Ironstone								
Bowl		1						1
Semi-porcelain								
Cup					1			1
Stoneware								
Bowl	1							1
Custard Cup		1						1
2 Gallon Crock				1				1
Tobacco Pipe								
Bowl			1			1		2
Stem							1	1

Table 8.20 14BU1008, Donaldson Stone House, Ceramic Paste/Glaze Types

	Surface	X.U. 1	X.U. 2	X.U. 3	X.U. 4	X.U. 5	Total
Earthenware/ Ironstone							
White glaze	1 (29.8g)	5 (66.9g)	4 (20.9g)		1 (5.6g)	5 (6.41g)	
Brown Transfer Printed ware					1 (3.1g)		
Earthernware							
Flow Blue		1 (8.6g)					1 (8.6g)
Porcelain							
White glaze			1 (4.3g)		1 (2.0g)		
Stoneware							
Albany glaze/ Albany glaze		2 (4.64g)		1 (.92g)			
Albany glaze/ Tan glaze		3 (289.7g)				1 (51.8g)	
Bristol glaze/ Bristol glaze				1 (8.5g)			
Pale Green glaze/ Pale Green glaze					2 (8.5g)		
Brick Red (unglazed)				4 (32.97g)			
Yellow glaze/ Yellow glaze with white and turquoise blue bands			1 (7.0g)				1 (7.0g)
Brick							
Low Fired		(4.8g)	(122.0g)	(6.2g)	(4.7g)	(.1g)	
High Fired		(11.9g)	(1115.6g)			(38.6g)	

Table 8.20 (Continued)

	X.U. 6	X.U. 7	X.U. 8	X.U. 9	Total
Earthenware/					
Ironstone					
White glaze	6 (13.58g)	2 (4.1g)	12 (21.29g)	12 (29.14g)	
Brown Transfer Printed ware		1 (1.2g)			2 (4.3g)
Earthenware					
Decalware	3 (5.0g)			1 (3.0g)	
Semi-porcelain					
White glaze				1 (1.9g)	
Hand painted				1 (6.3g)	1 (6.3g)
Porcelain					
White glaze	1 (38.8g)				
Hand painted				3 (3.95g)	
Brick					
Low Fired	(29.4g)	(6.2g)	(8.1g)	(25.1g)	
High Fired			(0.3g)	(42.5g)	
Stoneware					
Albany glaze/ Albany glaze	3 (19.2g)		3 (52.53g)	3 (22.44g)	
Black glaze/ Unglazed		1 (3.4g)			
Pale Green Glaze/ Pale Green Glaze		1 (9.3g)		1 (1.61g)	

Table 8.20 (Continued)

	X.U. 10	X.U. 11	X.U. 12	X.U. 13	Total
Earthenware/ Ironstone					
White glaze	18 (125.65g)	2 (8.5g)	4 (5.72g)	7 (9.01g)	
Copper Lustre Tea Leaf Pattern	1 (1.5g)				
Brick					
Low Fired	(16.7g)	(4.25)	(31.0g)	(20.0g)	
High Fired			(0.1g)		
Stoneware					
Albany glaze/ Albany glaze	2 (14.5g)		1 (7.3g)		
Albany glaze/ Tan glaze	1 (13.7g)			1 (42.1g)	
Albany glaze/ Brown Salt glaze	2 (85.3g)				2 (85.3g)
Bristol glaze/ Bristol glaze	1 (1.53g)	1 (63.3g)			
Albany glaze/ Medium Brown glaze			1 (58.5g)		1 (58.5g)
Brick Red glaze/ Brick Red glaze			1 (2.0g)		

Table 8.20 (Continued)

	X.U. 14	X.U. 15	X.U. 16	X.U. 17	X.U. 18	Total
Earthenware/ Ironstone						
White glaze	5 (33.63g)	20 (80.96g)		1 (0.41g)		
Earthenware						
Creamware		1 (20.2g)				1 (20.2g)
Hot Pink glaze				1 (2.1g)	3 (2.88g)	
Semi-porcelain						
White glaze	1 (2.0g)					
Decalware		1 (6.3g)				
Porcelain						
Decalware	1 (9.4g)					1 (9.4g)
Brick						
Low Fired	(2.8g)	(498.8g)	(2.1g)	(0.1g)		
High Fired w/ Blue/Gray glaze		(18.0g)			(13.0g)	(31.0g)
Stoneware						
Albany glaze/ Albany glaze	1 (4.1g)	1 (2.4g)				
Brick Red glaze/ Brick Red glaze		1 (35.4g)				
Albany glaze/ Tan glaze	1 (69.7g)	1 (12.9g)				
Brick Red (unglazed)	5 (31.84g)					
Black glaze/ Gray Salt glaze	1 (17.7g)					1 (17.7g)
White glaze/ Bright Orange glaze	1 (5.3g)					

Table 8.20 (Continued)

	X.U. 19	X.U. 20	X.U. 21	X.U. 22	X.U. 23	Total
Earthenware/ Ironstone						
White glaze	1 (1.8g)	2 (3.78g)		1 (.42g)		
Earthenware						
Hot Pink glaze	1 (.9g)					5 (5.88g)
Brick						
Low Fired	(6.2g)	(8.6g)	(1.5g)	(.1g)	(.1g)	
Stoneware						
Brick Red (Unglazed)				1 (1.12g)		

Table 8.20 (Continued)

	X.U. 24	X.U. 25	X.U. 26	X.U. 27	Total
Earthenware/ Ironstone					
White glaze	8 (8.11g)		2 (7.6g)	3 (1.17g)	
Copper Lustre Tea Leaf Pattern			1 (2.35g)		
Semi-procelain					
White Glaze			1 (2.6g)	1 (1.3g)	
Porcelain					
White glaze	1 (1.26g)				
Hand painted	1 (.53g)				
Brick					
Low Fired	(9.5g)	(3.5g)	(19.5g)	(51.3g)	
Stoneware					
Albany glaze/ Tan glaze	2 (11.68g)				
Brick Red (Unglazed)		1 (2.5g)			11 (68.43g)
Tortoise Shell Brown glaze/ Tortoise Shell Brown glaze		1 (1.91g)			1 (1.91g)
White glaze/ Bright Orange glaze		1 (.62g)			2 (5.92g)
Black glaze/ unglazed			1 (7.4g)		
Burnt Orange glaze/Burnt Orange glaze				1 (.8g)	1 (.8g)

Table 8.20 (Continued)

	X.U. 28	X.U. 29	X.U. 30	Total
Earthenware/				
Ironstone				
White glaze	13 (27.64g)	19 (39.11g)	9 (26.88g)	
Copper Lustre				
Tea Leaf Pattern		1 (4.6g)		
Blue Transfer				
Printed ware	1 (1.57g)			1 (1.57g)
Blue Willow		1 (1.54g)		1 (1.54g)
Earthenware				
Decalware	5 (5.44g)	2 (2.65g)		
Semi-porcelain				
White glaze		2 (2.87g)		6 (10.67g)
Decalware	1 (.63g)	1 (1.81g)		3 (8.74g)
Porcelain				
White glaze	2 (3.01g)	2 (5.6g)		
Hand Painted		2 (1.9g)		
Brick				
Low Fired	(39.8g)	(4.9g)	(147.0g)	
High Fired	(60.8g)		(50.0g)	
Stoneware				
Albany glaze/Tan glaze	2 (11.3g)			
Black glaze/unglazed	1 (2.3g)			3 (13.1g)
Albany glaze/Albany glaze	2 (6.7g)	1 (1.99g)		
Brick Red glaze/				
Brick Red glaze		1 (3.5g)		3 (40.9g)
Pale Green glaze/				
Pale Green glaze		1 (4.5g)		
Medium Brown glaze/				
Medium Brown glaze			1 (26.6g)	1 (26.6g)

Table 8.20 (Continued)

	X.U. 31	X.U. 32	Feature 3	Total
Earthenware/ Ironstone				
White glaze	10 (46.55g)	7 (37.29g)		180 (661.95g)
Copper Lustre Tea Leaf Pattern		1 (7.6g)		4 (16.05g)
Earthenware				
Decalware	1 (.73g)			12 (16.82g)
Creamware				
Decalware		1 (2.7g)		1 (2.7g)
Porcelain				
White glaze		1 (2.1g)		9 (57.07g)
Hand painted		2 (2.03g)		8 (8.41g)
Brick				
Low Fired	(304.5g)	(488.0g)	(694.0g)	(2560.8g)
High Fired	(1138.3g)		(1770.4g)	(4228.5g)
Stoneware				
Albany glaze/Tan glaze	1 (3.9g)			13 (506.78g)
Albany glaze/ Albany glaze	2 (15.6g)	3 (30.56g)		25 (182.88g)
Bristol glaze/ Bristol glaze		2 (31.82g)		5 (105.15g)
Albany glaze/Gray glaze		1 (10.9g)		1 (10.9g)
Pale Green glaze/ Pale Green glaze			1 (3.8g)	6 (27.71g)

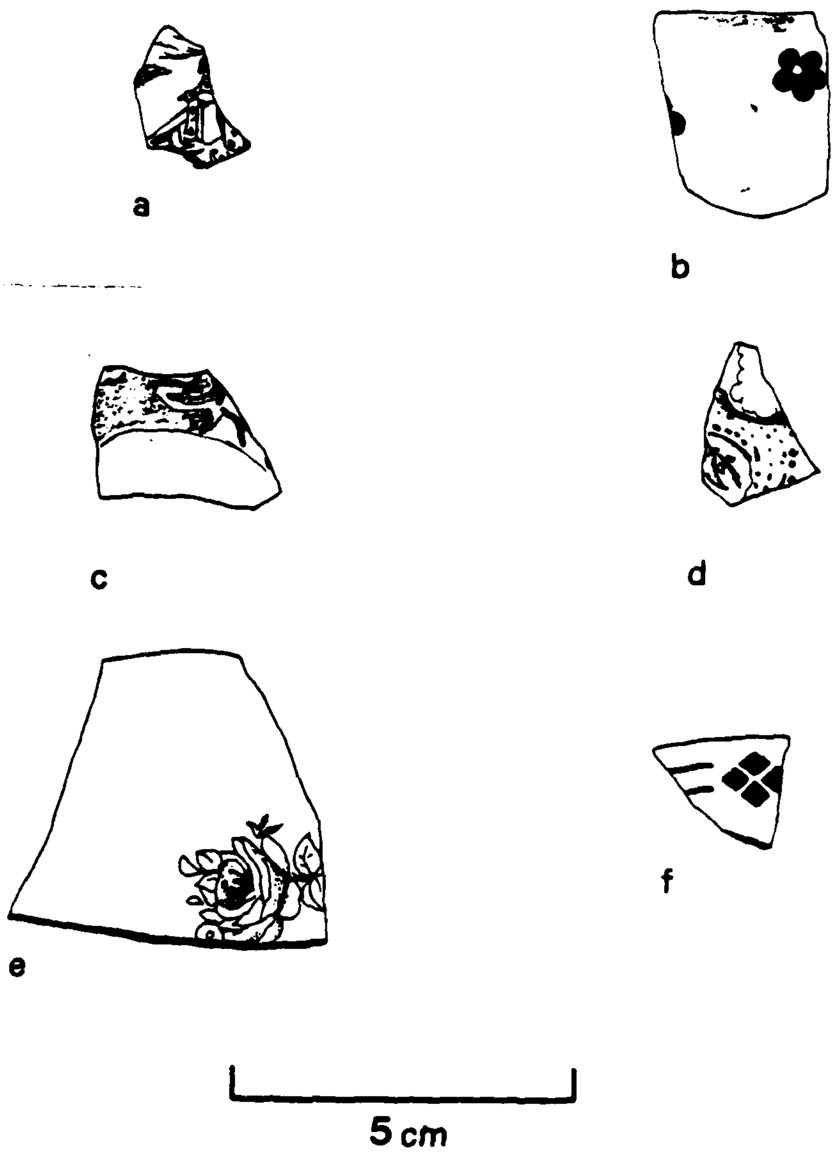

Figure 8.9. Porcelain. a. Porcelain cup in Rose Medallion design--hand painted red, blue and black landscape with Japanese figure in traditional clothing; b. Porcelain cup with hand painted overglaze design in green, orange and silver (probably Japanese); c. Porcelain teacup with hand painted overglaze design in green and gold; d. Porcelain sherd with hand painted green and gold design (looks Japanese); e. Porcelain bowl with decalware motif of a pink rose with green and yellow leaves (possibly German); f. Porcelain teacup with blue and green hand painted design.

14BU1008 - The Donaldson Stone House Site

The Donaldson Stone house was constructed in 1869 and was used as a family dwelling until 1974. The Donaldson family was well off financially - in 1867 George Donaldson was "one of the town's wealthiest citizens. In 1867 he paid the largest amount of tax on personal property, valued at $5,290, in all of Butler County." The stone house portrays this wealth and a complete discussion of its architectural significance can be found in Roberts (1979).

Excavations at the site uncovered a refuse area near the stone house. Ceramics recovered from the Donaldson site portray the greatest variability in both paste and decoration of any site in the study area. Table 8.20 demonstrates this variability. Of particular mention are the oriental porcelain sherds uncovered (see Fig. 8.9) as these are the only pieces of this kind yet found in the lake area. Coupled with decorated ironstone vessels such as the copper lustre tea leaf pattern (see Fig. 8.10), the ceramic archaeological record portrays dramatically the wealth of the occupants.

Functionally, the ceramics include the usual utilitarian vessels but add such luxury items as an ash tray and a bone dish (see Table 8.21).

Summary

In summary, the ceramics recovered from excavations in the El Dorado Lake area tell the archaeologist a great deal about the life on the frontier. Differences in status are evident in the ceramic record as well as site use varieties.

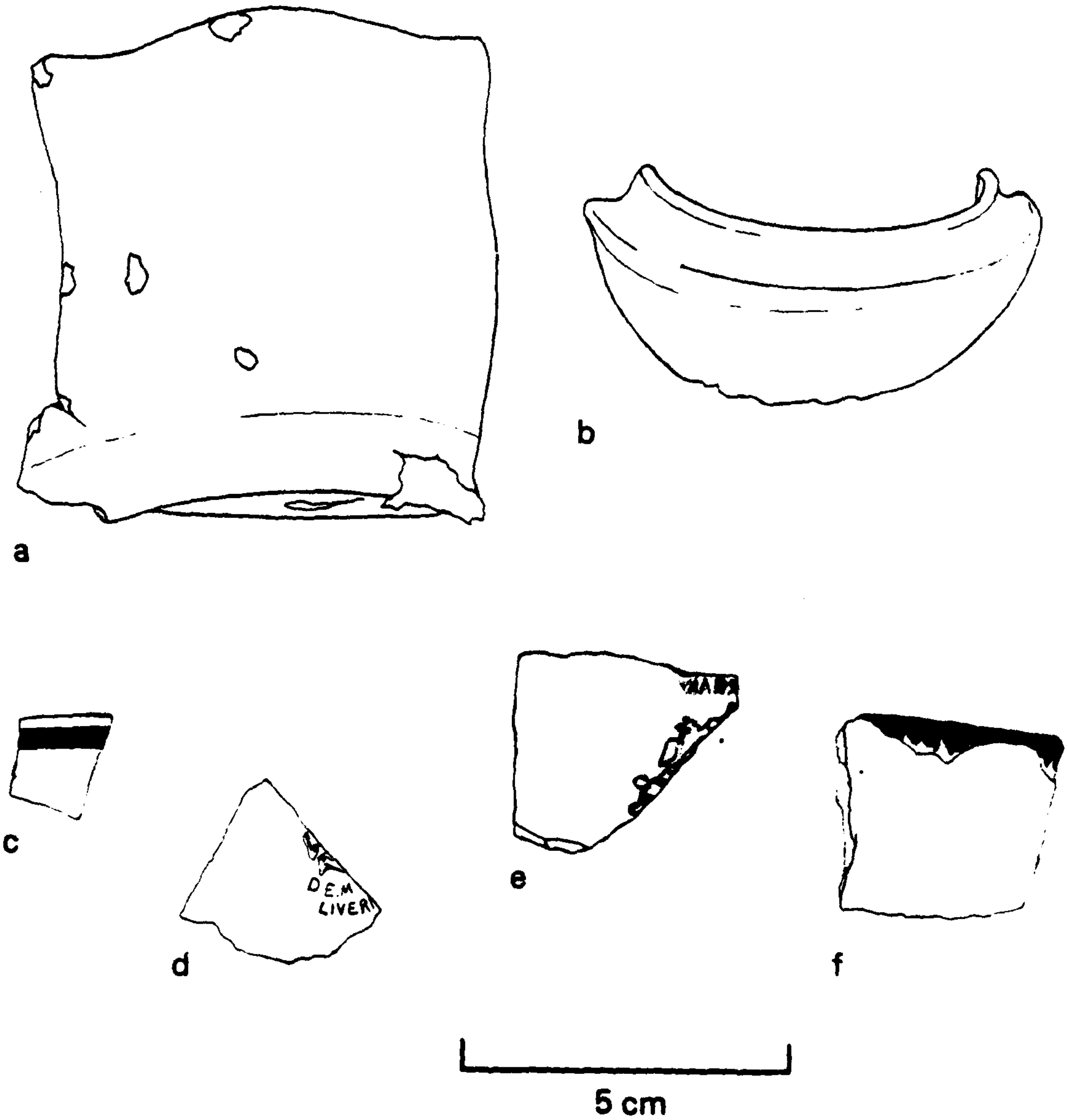

Figure 8.10. Ironstone Ceramics. a. Side view of an ironstone serving bowl, white glaze; b. Ironstone white glaze teapot lid; c. Alfred Meakin & Ltd., copper lustre tea leaf pattern coffee cup; d. Ironstone sherd with mark of D.E. McNichal Pottery Company, East Liverpool, Ohio USA dated after 1892; e. Ironstone sherd with Warr...(ented Stoneware) mark American made; f. Ironstone Staffordshire plate with dark blue transfer printed feather edge--flow blue.

Table 8.21 14BU1008 Donaldson Stone House, Ceramic Functional Types

	Surface	XU 1	XU 2	XU 3	XU 4	XU 5	XU 6	XU 8	Total
Earthenware									
Ironstone									
Chamber pot	1								1
Plate			1		1		1	1	
Cup			2			1	1	1	
Serving bowl		2							
Saucer						1		1	
Flow Blue									
Plate		1							1
Decalware									
Plate							1		1
Ash tray							1		
Porcelain									
Hand painted									
Tea cup			1						
Porcelain and Metal Castor							1		1
Stoneware									
Crock								1	
1 Gallon crock						1			1
2 Gallon crock		1							1
5 Gallon crock		1							1
Mixong bowl			1						
Flower pot				3					

Table 8.21 (Continued)

	XU 9	XU 10	XU 11	XU 12	XU 13	XU 14	XU 15	Total
Earthenware								
Ironstone								
Plate		2		1		1	2	
Cup	2	2			1			
Serving bowl		1						
Saucer	2						1	
Bowl		2				1		3
Tea Pot lid		1						1
Creamware								
Plate							1	1
Copper Lustre								
Tea Leaf Pattern								
Coffee cup		1						
Semi-porcelain								
Decalware								
Bone dish							1	
Hand painted								
Bone dish	1							1
Porcelain								
Decalware								
Bowl						1		1
Hand painted								
Tea cup	3							
Stoneware								
Crock		1						2
Mixing bowl			1					2
Flower pot						1		
Bean pot							1	1
3 or 4 Gallon crock				1	1			2
5 or 6 Gallon crock						1		1

Table 8.21 (Continued)

	X.U. 17	X.U. 19	X.U. 24	X.U. 25	X.U. 26	Total
Earthenware						
Ironstone						
Cup					1	
Copper Lustre						
Tea Leaf Pattern						
Saucer					1	1
Hot Pink glaze						
Tea cup	2	1				3
Procelain						
Hand painted						
Tea cup			1			
Stoneware						
Flower pot				1		5
Custard cup				1		1

Table 8.21 (Continued)

	X.U. 28	X.U. 29	X.U. 30	X.U. 31	X.U. 32	Total
Earthenware						
Ironstone						
Cup	1	4		1	2	19
Plate	1				1	12
Serving bowl	1			1		5
Platter				2		2
Saucer		1				6
Copper Lustre						
Tea Leaf Pattern						
Coffee cup		1				2
Plate					1	1
Blue Willow						
Plate		1				1
Decalware						
Ash tray	3					4
Cup		1				1
Saucer	1					1
Creamware						
Decalware						
Saucer					1	1
Semi-porcelain						
Decalware						
Bone dish		1				2
White glaze						
Cup		1				1
Porcelain						
Hand painted						
Saucer					1	1
Tea cup		1				6
Doll Head	1					1
Button					1	1
Stoneware Bowl			1		1	2

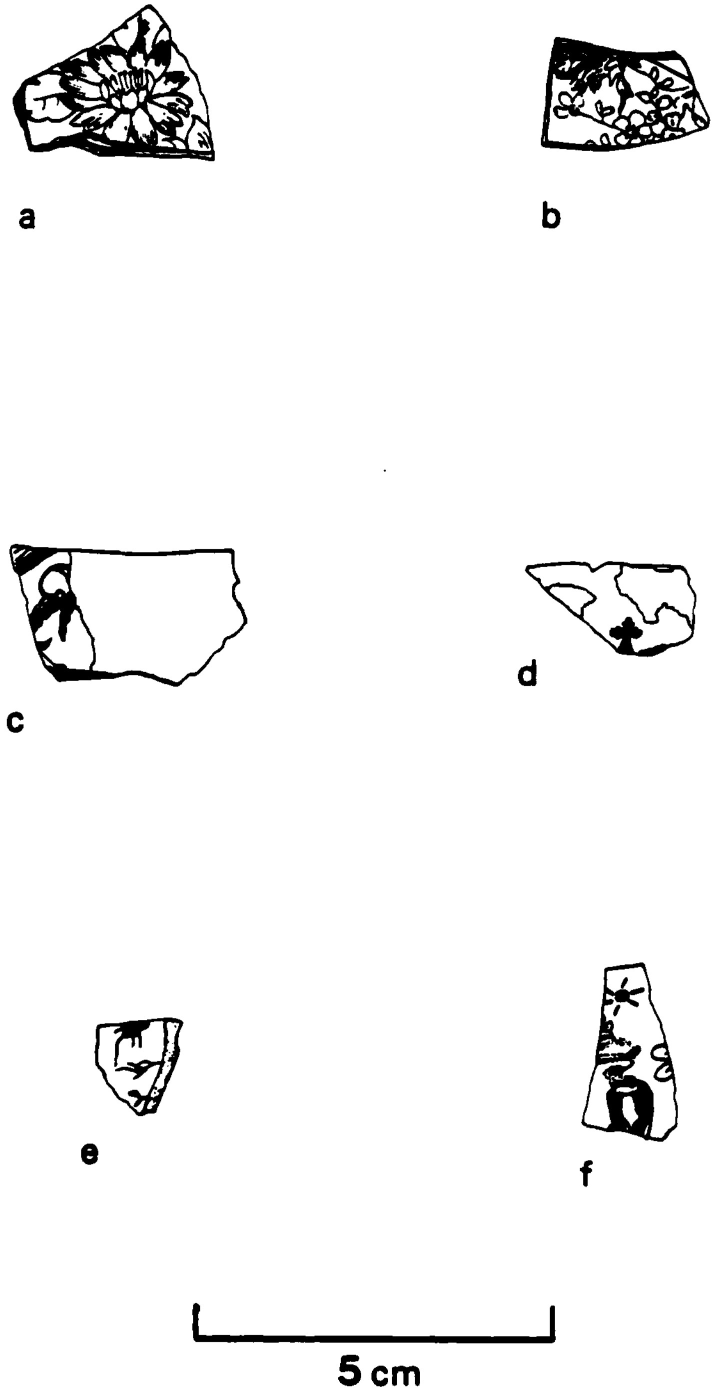

Figure 8.11. Decalware and Transferware. a. Ironstone sherd with floral decal in green and rose; b. Ironstone sherd with floral decal in pink, blue and green; c. Ironstone sherd with brown transfer printed design--a dove with spread wings at the rim; d. Ironstone sherd with brown transfer printed cross design--could be part of the maker's mark; e. Green Transfer printed Ironstone in unidentifiable motif; f. Ironstone Red Cambridge ash tray with a deep red decal--pipe and smoke with sun and flowers.

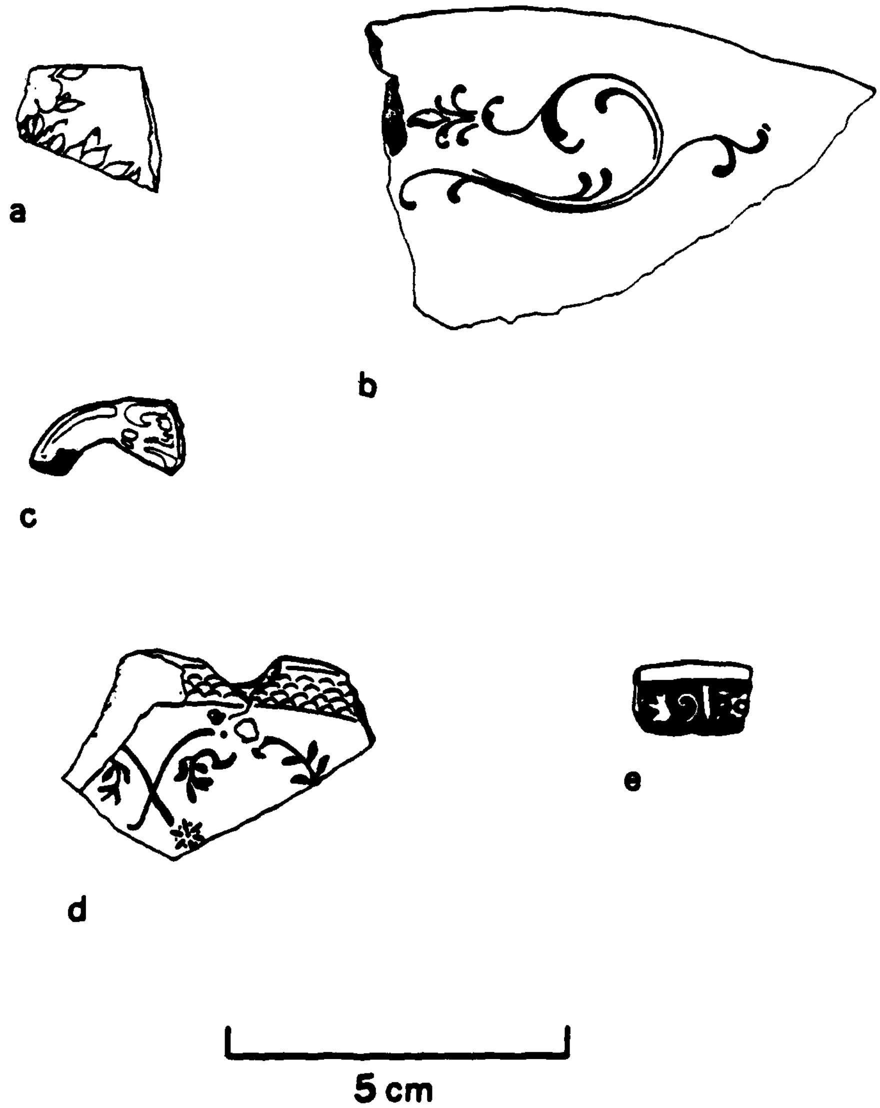

Figure 8.12. Decalware. a. Ironstone plate with pink, blue, green and gray floral decal on exterior; b. Creamware plate with gold highlights applied as a decal; c. Earthenware teacup handle in a hot pink glaze; d. Semi-porcelain bone dish with molded design at rim and a decal of crossed stalks; e. Ironstone Red Cambridge ash tray fragment with decal decoration at rim in deep red.

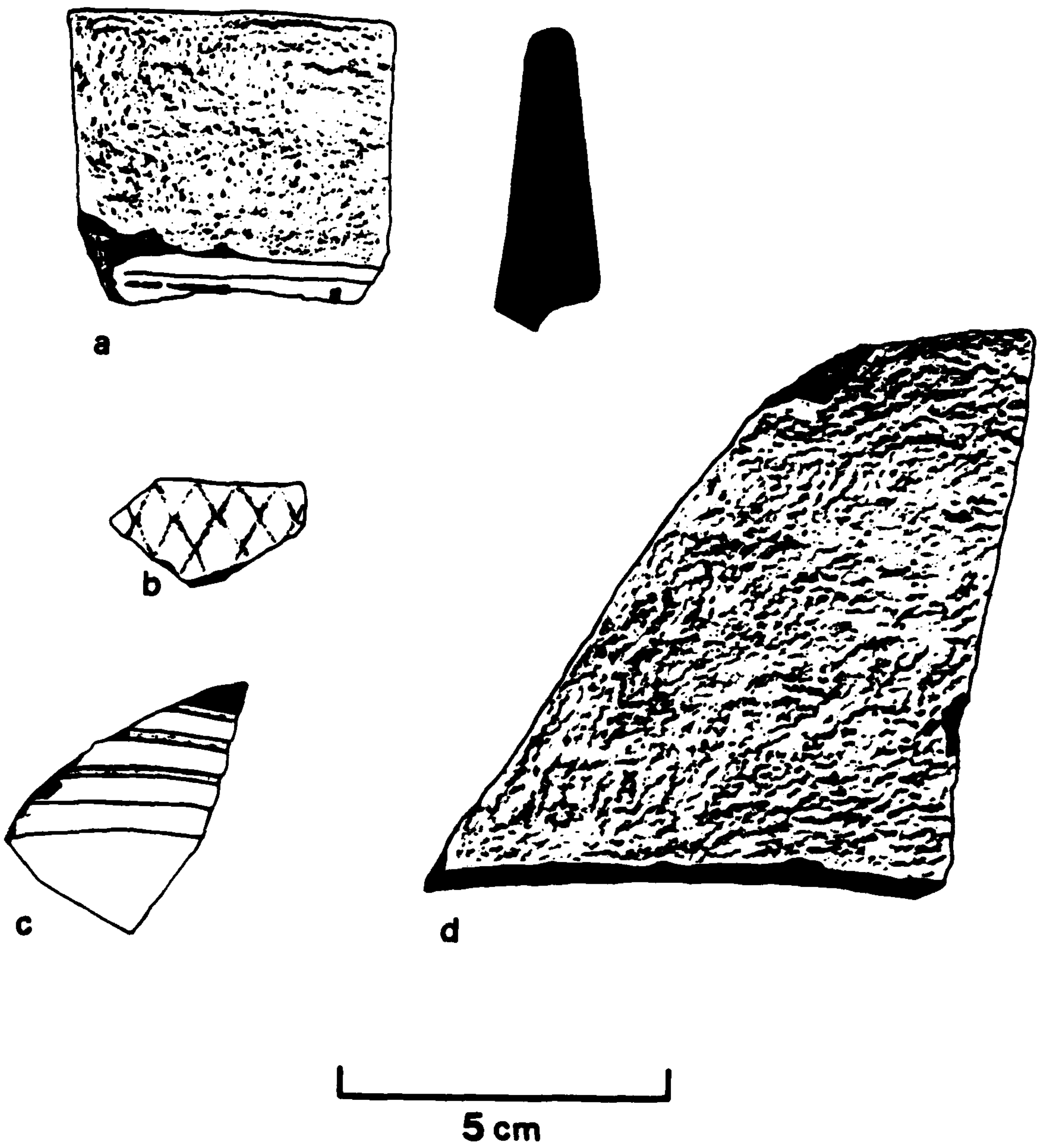

Figure 8.13. Stoneware. a. Stoneware 3 or 4 gallon crock sherd with Albany glaze on interior and Tan glaze on exterior; b. Stoneware with black glazed interior and unglazed exterior with a cross hatch design (could be a pineapple motif); c. Stoneware refrigerator or mixing bowl with a yellow glaze and 3 white and 1 turquoise blue band on exterior; d. Stoneware crock sherd with brown salt glaze exterior.

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Chapter 9

ARCHAEOLOGICAL TESTING OF HISTORIC SITES IN THE EL DORADO LAKE AREA

Kenneth L. Brown

Introduction

Archaeological examination of historical resources within the El Dorado Lake area was carried out during the summer of 1979. The work conducted in 1979, in conjunction with that of 1978, has resulted in a new body of data related to American settlement and adaptation to the environment during the last half of the 19th century. Within the boundary of El Dorado Lake are some of the first farm settlements, 14BU1004 and 14BU1008, and the first town in Butler County, 14BU1012. The history of this part of Butler County is illustrative of the history of Kansas and the Flint Hills geographic region (Roberts 1981).

On the basis of results from the work conducted in 1978, primary goals for the testing of historic sites during the summer of 1979 were four-fold:

(1) locate and identify the original town site of Chelsea;

(2) locate and identify the placement of the structures at Fort Bend;

(3) conduct test excavations to recover a representative sample of artifacts from a log cabin site;

(4) conduct test excavations to recover a representative sample of artifacts from a later dwelling structure.

This was designed to fit our general research goal: acquisition of data helpful in understanding the adaptations of the settlers to their environment, the economic networks that were operating, and the social systems that existed. These data could then be quantified to form a frontier "pattern" (South 1977:31-46) that could be compared with other frontier "patterns" (Roberts 1981).

Surveys to delimit exact geographic locations for two historic period sites were carried out during the summer of 1979. These sites were 14BU1012, the original Chelsea town site, and 14BU1009, Fort Bend, a Civil War era site. In addition, test excavations were performed at two historic period sites during the summer of 1979. A crew of 11, under the direction of the historical archaeologist, carried out the tecting in nine days. The two sites were (1) the Osborn log cabin site, 14BU1004, and (2) the Donaldson stone house, 14BU1008. Data recovered by these excavations both supplemented and elaborated upon the documentary record. Figure 1 shows the four sites investigated.

All excavation units were one meter square and dug in arbitrary 10 cm. levels. Each excavation unit was assigned a unique number sequentially as it was opened. All soils were manually dug with the use of shovels and

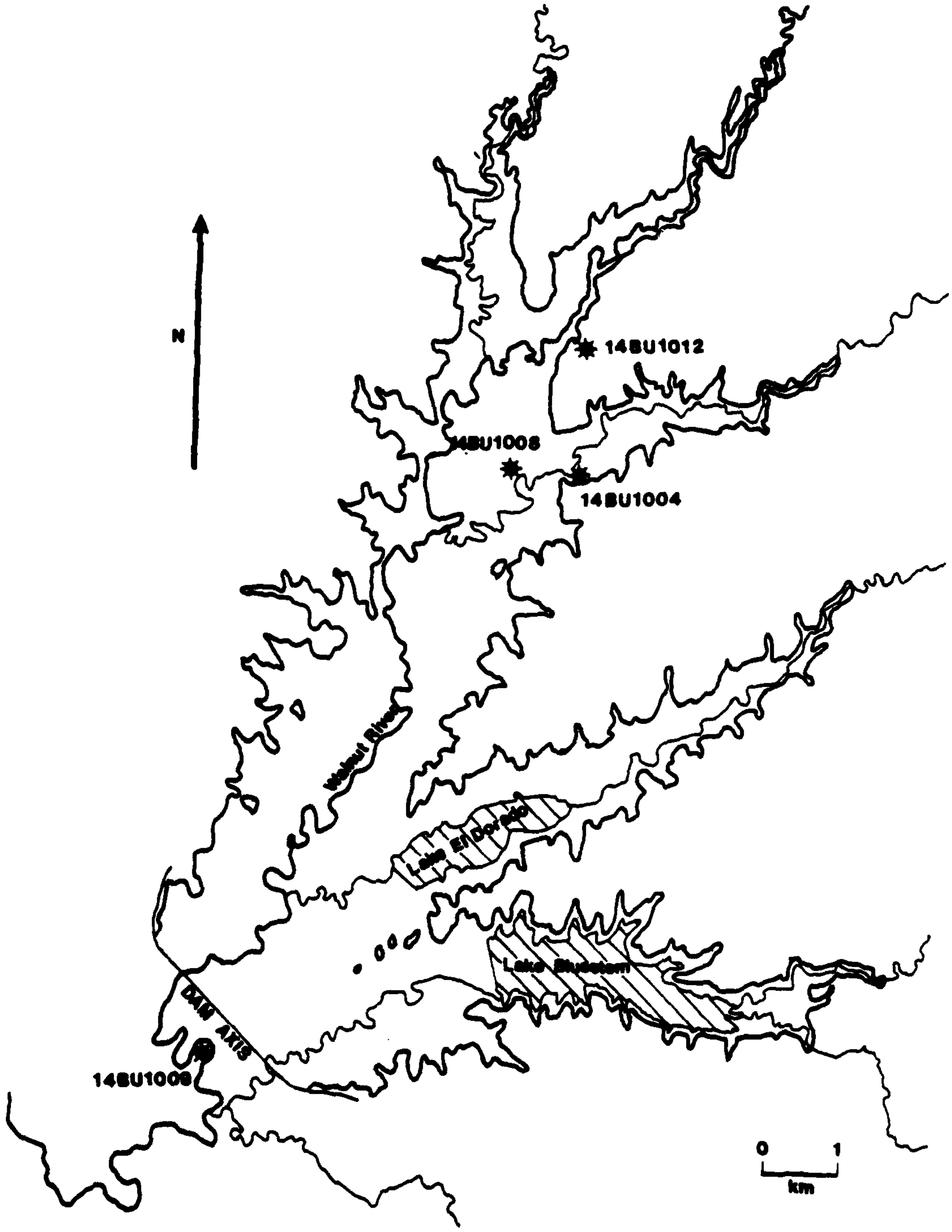


Figure 9.1. Map of El Dorado Lake and the four historic sites examined for cultural remains.

trowels. Soils were screened through one-quarter inch hardware cloth. Artifacts recovered during screening were bagged according to excavation unit and level. Only artifacts which had discernible maker's marks or were datable were plotted three-dimensionally.

Excavations were placed in what was believed to have been the locations of past structures or primary refuse disposal areas. This resulted in greater quantities of artifacts recovered from the excavations.

A major artifact category for all the sites investigated and reported here is bottle glass. Bottle glass rims are excellent temporally diagnostic artifacts for the period with which we are concerned here. For the description of bottle glass rims, a code of 14 types has been established. Figure 2 illustrates the 14 different rim types used in describing the bottles in this report. Some of the rim types are taken from Bottle Identification by H. E. Putnam (1965).

14BU1009 - Fort Bend

Fort Bend, 14BU1009, is located in a meander loop south of the dam on the right bank of the Walnut River. Figure 3 shows the site area and the location of specific field investigations.

In the summer of 1861, after the outbreak of the Civil War, residents of Butler County organized all able-bodied men into a company for local protection. Fort Bend was constructed within a horseshoe shaped meander of the Walnut River between El Dorado and Chelsea (Wilk 1981; Thomas, this volume). It was protected by the Walnut River on three sides and by log and earth breastworks on the other. Approximately 30 to 50 militiamen occupied the fort during the winter of 1861-1862 (Wilk 1980). By the spring of 1862, the militia disbanded, and Fort Bend was vacated (Wilk 1981; Thomas, this volume).

During the summer of 1979 an attempt was made to locate and recover archaeological materials from Fort Bend. The horseshoe meander believed to have been the location of Fort Bend had subsequently grown over in large trees and underbrush, making ground visibility zero. Mechanized power equipment was used to remove this brush and the humus zone. Remains of breastworks or buildings were not discernible. However, in the northeast corner of the meander (Fig. 3) a slight depression was discernible. For further examination, mechanized power equipment was used to dig two 24 inch wide, two meter deep trenches perpendicular to the shallow depression in an attempt to locate and discern a log breastwork and/or fortification trench.

Soil disturbances which could be attributable to a fortification ditch or to breastworks were not discernible in the trench walls. It is believed that the brief occupation of Fort Bend, the summer of 1861 to the spring of 1862, and the temporary log and tent structures used in the fort's construction did not leave discernible evidence for the archaeological record. Flooding of the Walnut River has probably destroyed or deeply

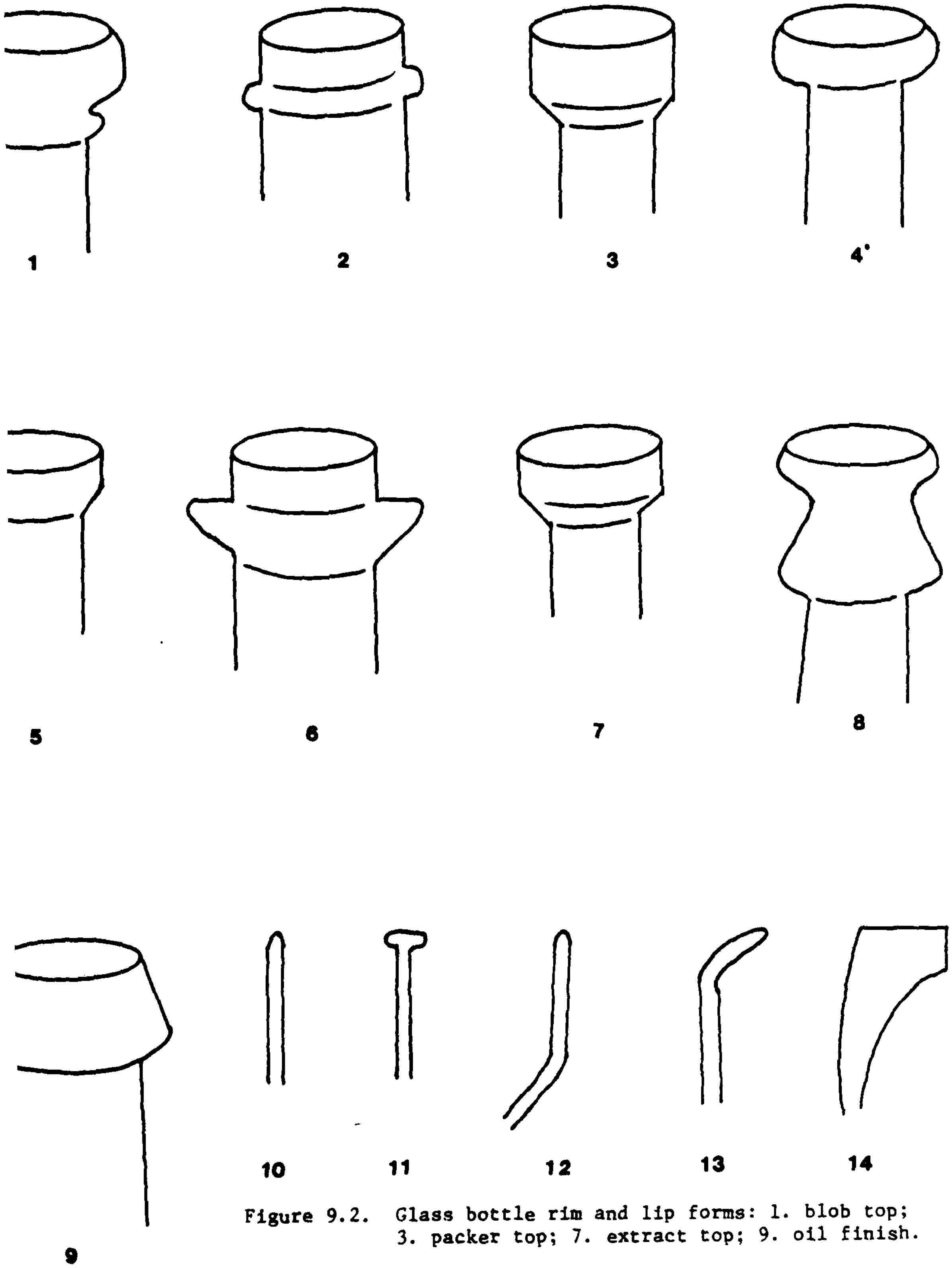


Figure 9.2. Glass bottle rim and lip forms: 1. blob top; 3. packer top; 7. extract top; 9. oil finish.

Figure 9.3. Aerial view of 14BU1009, Fort Bend, showing areas of vegetation removal and backhoe trenches.

buried any tangible evidence of Fort Bend.

14BU1012 - Old Chelsea

The site of Old Chelsea, 14BU1012, is located on a hill known locally as Chelsea Hill, one-half mile north of the Chelsea Cemetery. The site is located about 10 miles northeast of modern El Dorado on the Walnut River. The legal description included four quarter sections from four different sections. The land is presently in pasture.

On February 11, 1858, the Chelsea Town Company was incorporated on the approval of the acting governor of Kansas Territory, J. S. Denver (Thomas, this volume). The Chelsea Town Company was given authority to purchase up to 320 acres of land in Butler County and to survey it into blocks, lots and squares. The first plat was made on land between the Emporia Trail and Durachen Creek (Thomas, this volume). The legal records on file in the Butler County Courthouse fail to provide either a precise location or the physical appearance of Chelsea for the first decade of its existence. A variety of commercially produced maps indicate several locations of the town site (see Thomas, this volume).

Descriptions of Chelsea indicate it was situated on a high hill with a view of the surrounding lands (Thomas, this volume). Chelsea's location was reported to have been in close proximity to an ample supply of water and timber. The Walnut River provided a year-round water supply and the forests along its banks provided wood products for building construction. The Chelsea town site was also reported to have been located on a deposit of excellent limestone which could be easily cut and used for building material (Thomas, this volume).

On the basis of the non-specific legal descriptions and the topographic and geologic descriptions, an archaeological team consisting of 11 people systematically traversed, in the cardinal directions, approximately 80 acres (32.4 hectares) owned or leased by the U. S. Army Corps of Engineers and thought to be the area in question. Members of the archaeological team were spaced approximately 10 to 15 meters apart in a cardinal direction and were instructed to dig small holes, with standard size shovels, at intervals of 20 meters while traversing the fields. This shovel testing did not yield artifacts which could be attributed to the location of the town site of Chelsea.

However, shovel testing did reveal a shallowly buried sub-stratum of limestone west of the area designated 14BU1012. The location of site 14BU1012 on the prominent hill called "Chelsea Hill" and its proximity to the limestone strata provides collaborative data to indicate that the present location known as "Chelsea Hill", now the Manka Farm, is the location of the original town site of Chelsea from 1858 to 1870 (Thomas, this volume).

Since this property is now under private ownership, and outside the direct impact area of El Dorado Lake, no further archaeological investigations were undertaken. Figure 4, a black and white print of an aerial

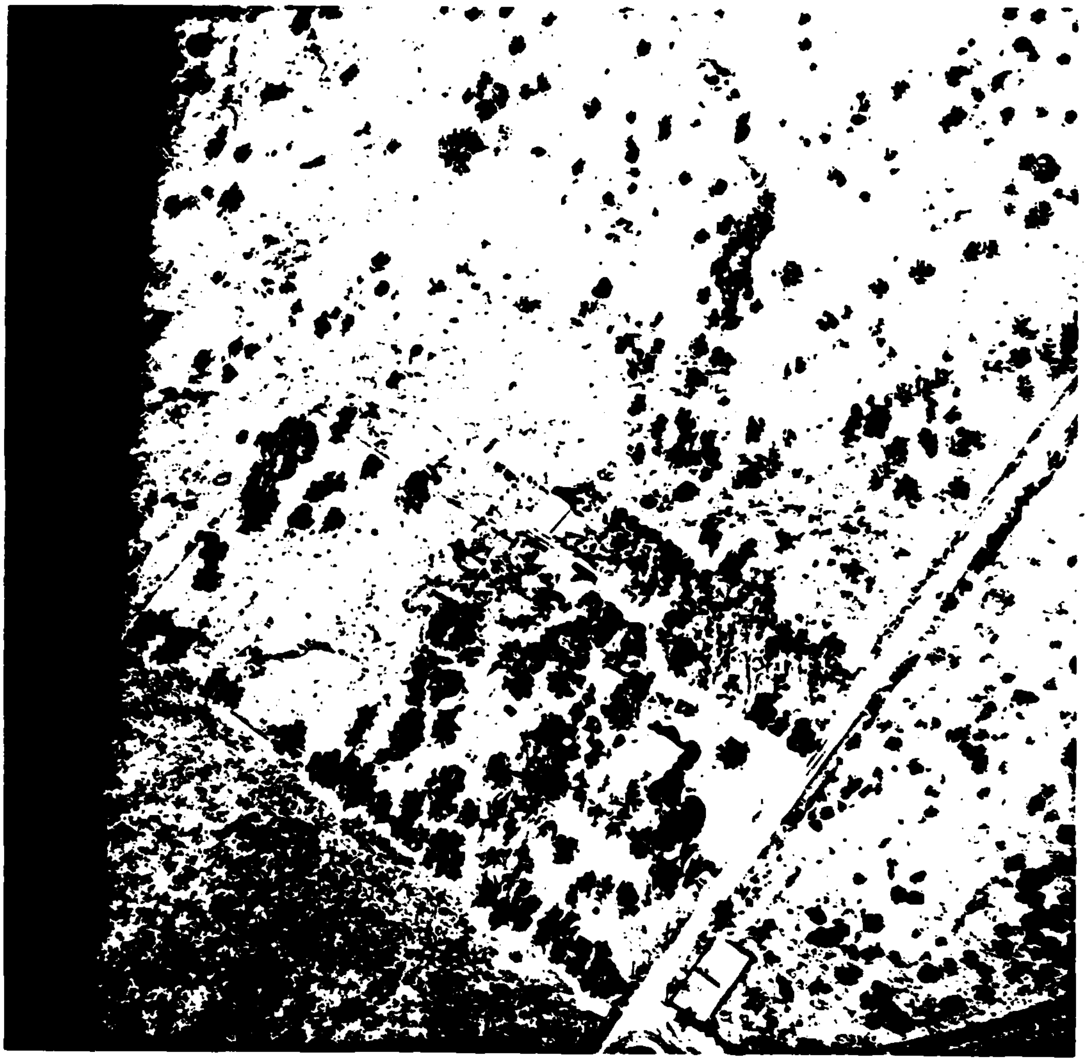


Figure 9.4. Aerial view of 14BU1012, the town of Old Chelsea.

color infrared photograph, shows the location for the original town of Chelsea.

14BU1004 - The Osborn Log Cabin

The Osborn log cabin site, 14BU1004 (Fig. 5) is situated on the floodplain of Durechen Creek. The area immediately around the site is cultivated, but there is sufficient timber only 100 meters to the west. This site is to be inundated by El Dorado Lake.

History

This site is the location of a log cabin built by Phineas Osborn in approximately 1874 when he first came to Chelsea Township. He had traveled west with a group of New Yorkers who settled in this area. The log cabin has since either been moved or destroyed, since structural remains are now absent. This site is significant because few of the original homestead sites have been identified archaeologically in the El Dorado Lake area. The lack of accurate records and the high number of homesteads built near rivers and subsequently eroded are the two principal reasons for this deficiency. Further archaeological investigations were thus warranted for this site (Roberts and Wilk 1981).

Intensive Surface Collection

The goal of intensive surface collecting and test excavations was to locate and explore the remains of a log cabin constructed in 1874. The site is presently in cultivation and visible on the surface were glass, ceramic, metal, and stone pieces concentrated within a small area. A small surface grab sample of 19 artifacts was made.

To delimit the horizontal limits of the site an intensive, systematic surface collection was made. Because of the small area involved, only 53 5 m^2 grid units were necessary to cover the site (see Figures 5 and 6).

The site had recently been plowed, and a heavy rain had fallen, allowing excellent surface visibility. A datum (100 East, 100 North, 0 Vertical) was established on what was believed to have been the western edge of the site (Fig. 6). All subsequent provenience data were related to this datum. A Cartesian coordinate grid was established over the site.

Each 5 m^2 was intensively examined by one person. All cultural materials within each unit were collected. The results of the surface collection, with respect to the distribution of all cultural materials, are shown in Figure 7. The range of artifacts varied from 0 to 52 pieces per grid unit.

The highest densities of artifacts, as shown in Figure 7, were found in the central portion of the grid. The average number of artifacts per grid unit is 13.4 with a standard deviation of 14. Of the 53 grid units,

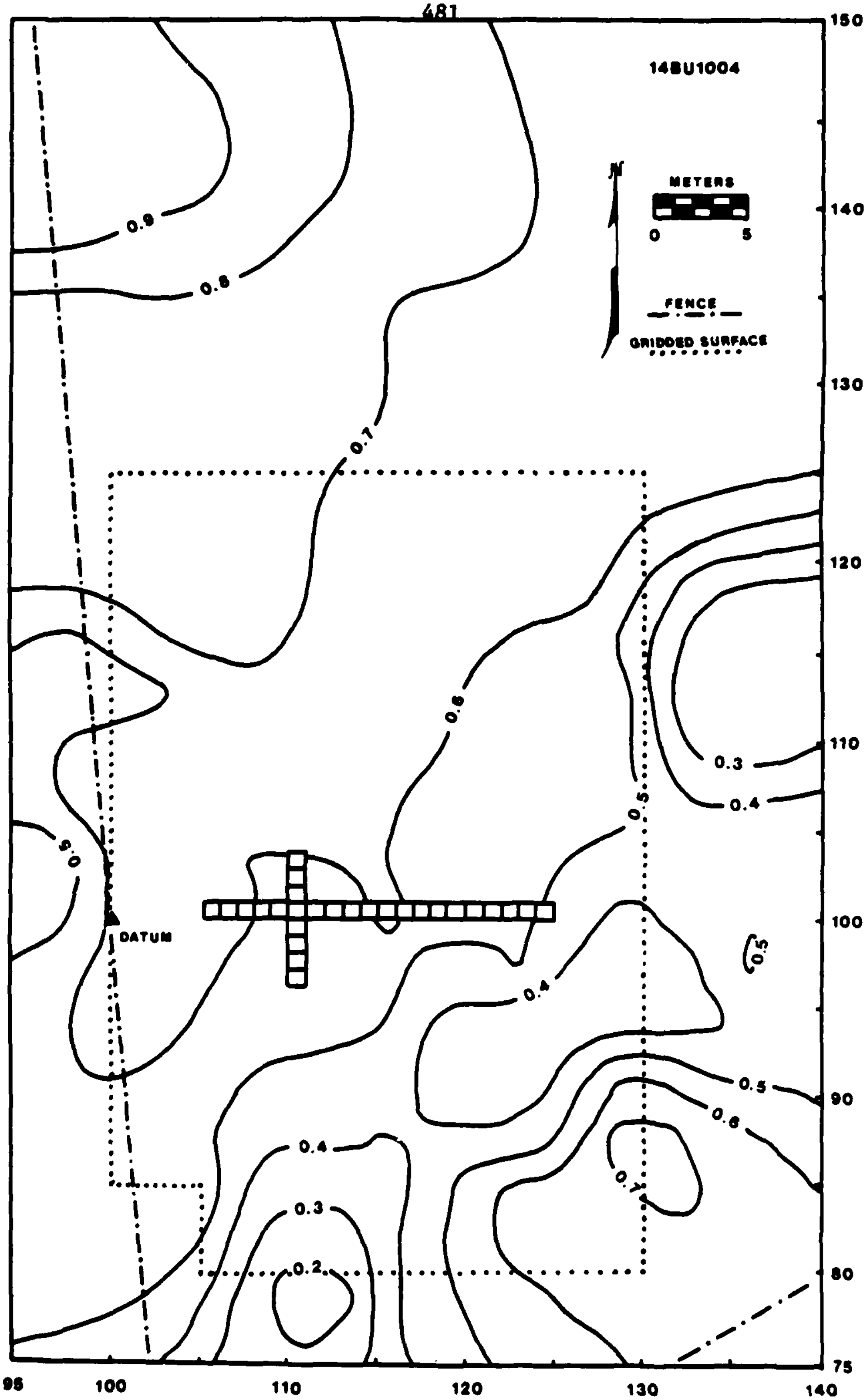


Figure 9.5. Topographic map of 14BU1004, the Osborn Log Cabin site.

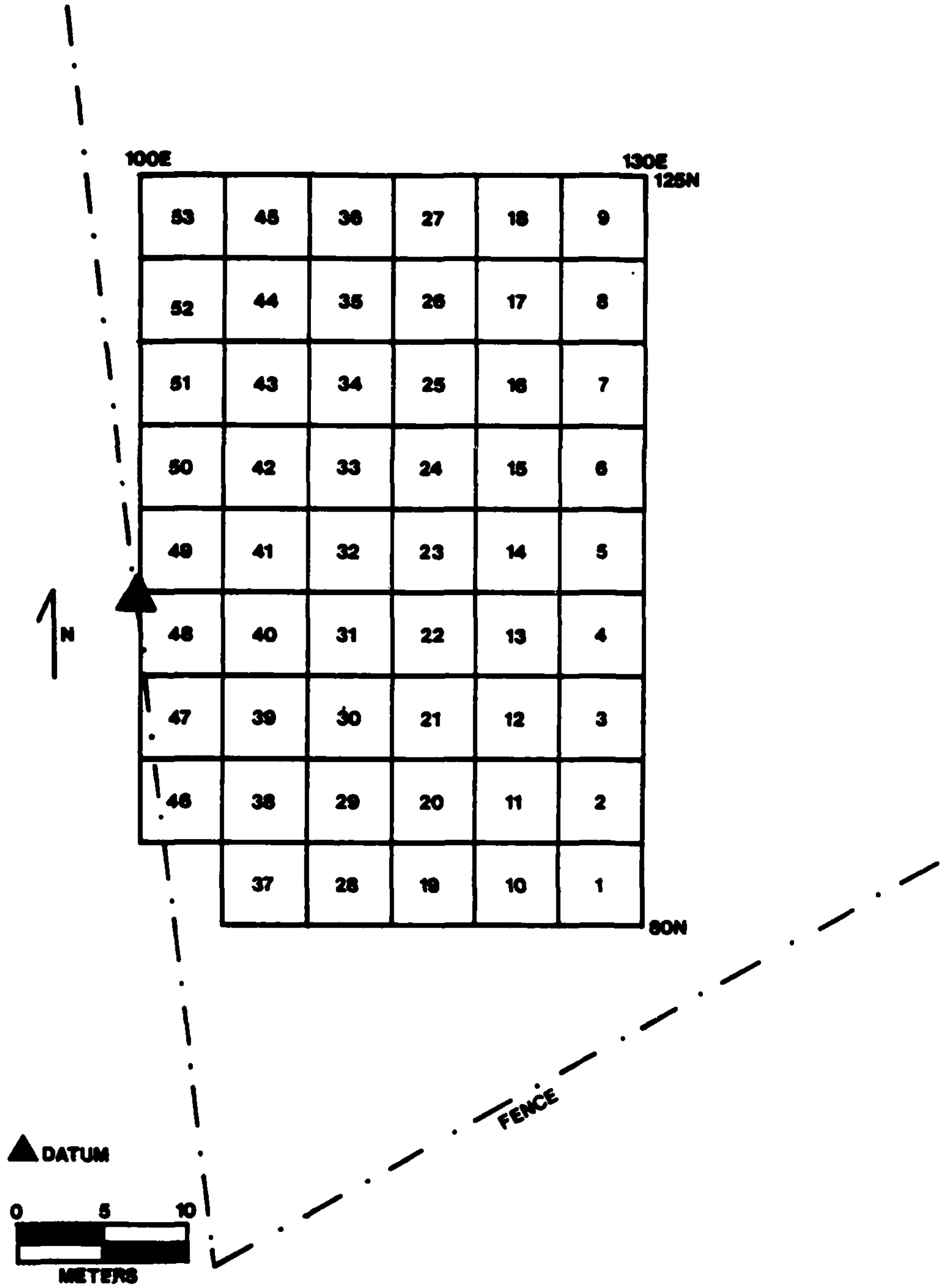


Figure 9.6. Schematic map showing the unit numbers of the gridded surface collection at 14BU1004.

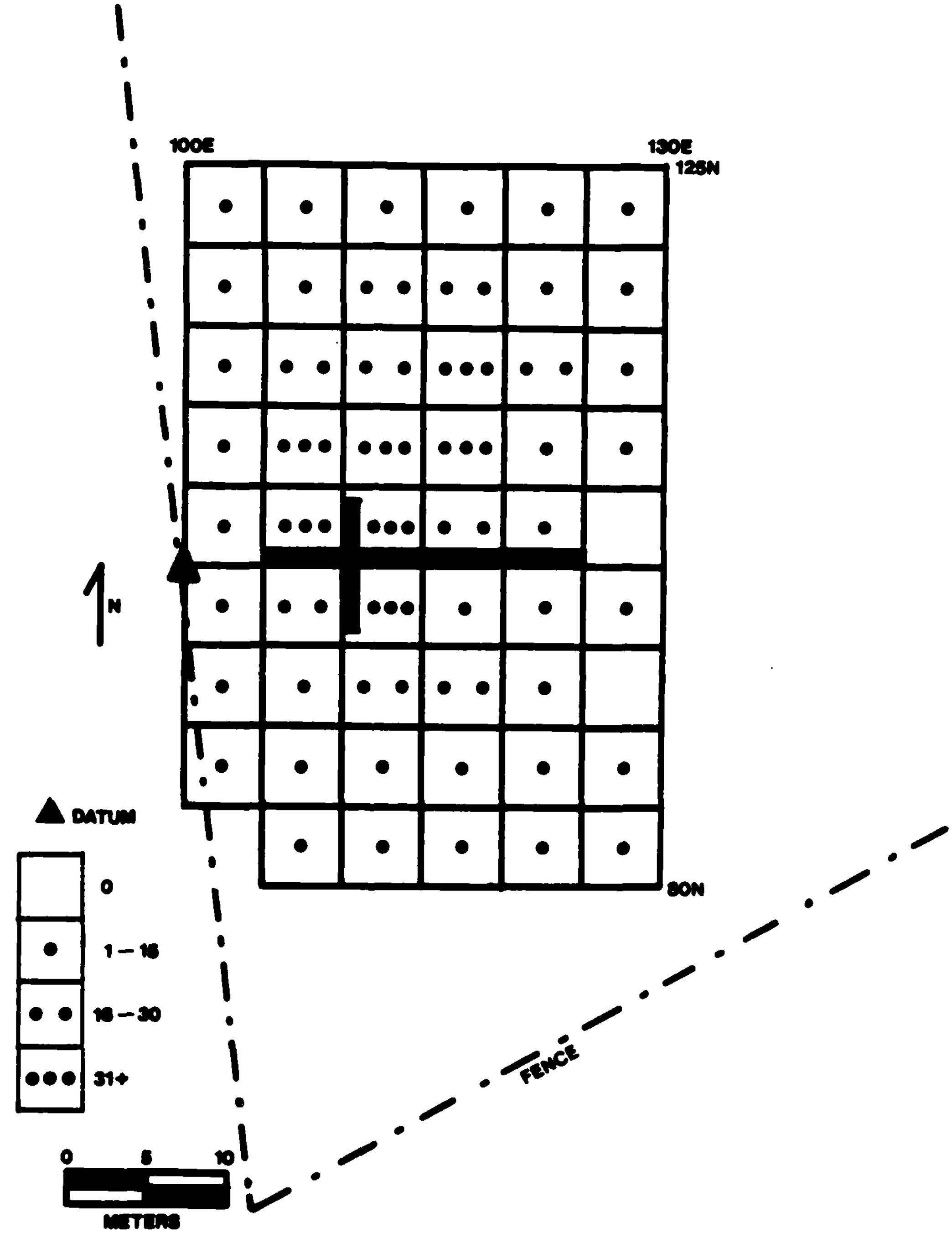


Figure 9.7. Map showing the distribution of artifacts collected from the surface of 14BU1004.

18 have quantities greater than the mean. It is suggested, based on the intensive surface collection, that the Osborn log cabin was located 90 to 125 meters north and 105 to 120 meters east of our datum. Figures 8 through 11 show, respectively, the distributions of bottle glass, window glass, nails and ceramics. The intensive surface collection yielded large quantities of cultural materials, including distinctive artifacts useful for inferring activities performed at the site.

Test Excavations

Test excavations consisting of two, 1 meter wide, perpendicular trenches through the center of the site were located to provide the most information about the exact placement of the log cabin and to recover a representative sample of cultural materials to substantiate and elaborate upon the written history of Phineas Osborn.

The long trench (Fig. 12) was located on the 100 meter north line and extended from 105 to 125 meters east of datum. A shorter trench, perpendicular to the first, was excavated along the 110 meter east line, extending from 96 to 104 meters north of datum. Excavation units were one meter square and numbered sequentially 1 to 27 as they were dug. Prior to the excavation of a unit, elevation of the ground surface in the southwest corner of the unit was determined relative to the datum.

The plow zone was determined to be approximately 18 to 20 cm. deep, with most cultural materials occurring in the plow zone and rapidly diminishing in frequency at greater depths. Excavation units 17, 19, and 20 were dug only to a depth of 10 cm. due to the lack of artifacts. Excavation units 5, 11, and 25 were dug to a depth of 30 cm., while excavation units 6, 7, and 24 were dug to a depth of 40 cm. All other excavation units were dug to a depth of 20 cm. Figure 13 shows schematics of the soil profiles of the east wall of excavation unit 24, the south wall of unit 7, and the east wall of excavation unit 21.

Excavations yielded large quantities of artifacts consisting mostly of bottle glass, window glass, ceramics, and square-cut nails. Soil composition changed along the east-west trench. In the western portion the soil was loose, dark, and contained large quantities of gravel. The eastern part yielded clayey soil with little or no gravel. The gravel deposits appeared heaviest from 108 to 113 meters east. Gravel occurred to a depth of 10 cm. at 107 meters east and to 30 cm. at 111 meters east. The large quantity of gravel is probably associated with the floor or immediate area surrounding the log cabin. The gravel would have been hauled in to provide a more stable ground surface to walk upon.

Figures 14 to 19 show distributions of some of the more numerous artifact types within the two test trenches. Figure 14 shows the distribution of square-cut nails. The nails are concentrated between 109 to 115 meters east and 96 to 103 meters north.

Figure 15 shows the distribution of window glass. The window glass clusters between 105 to 116 meters east and 96 to 104 meters north.

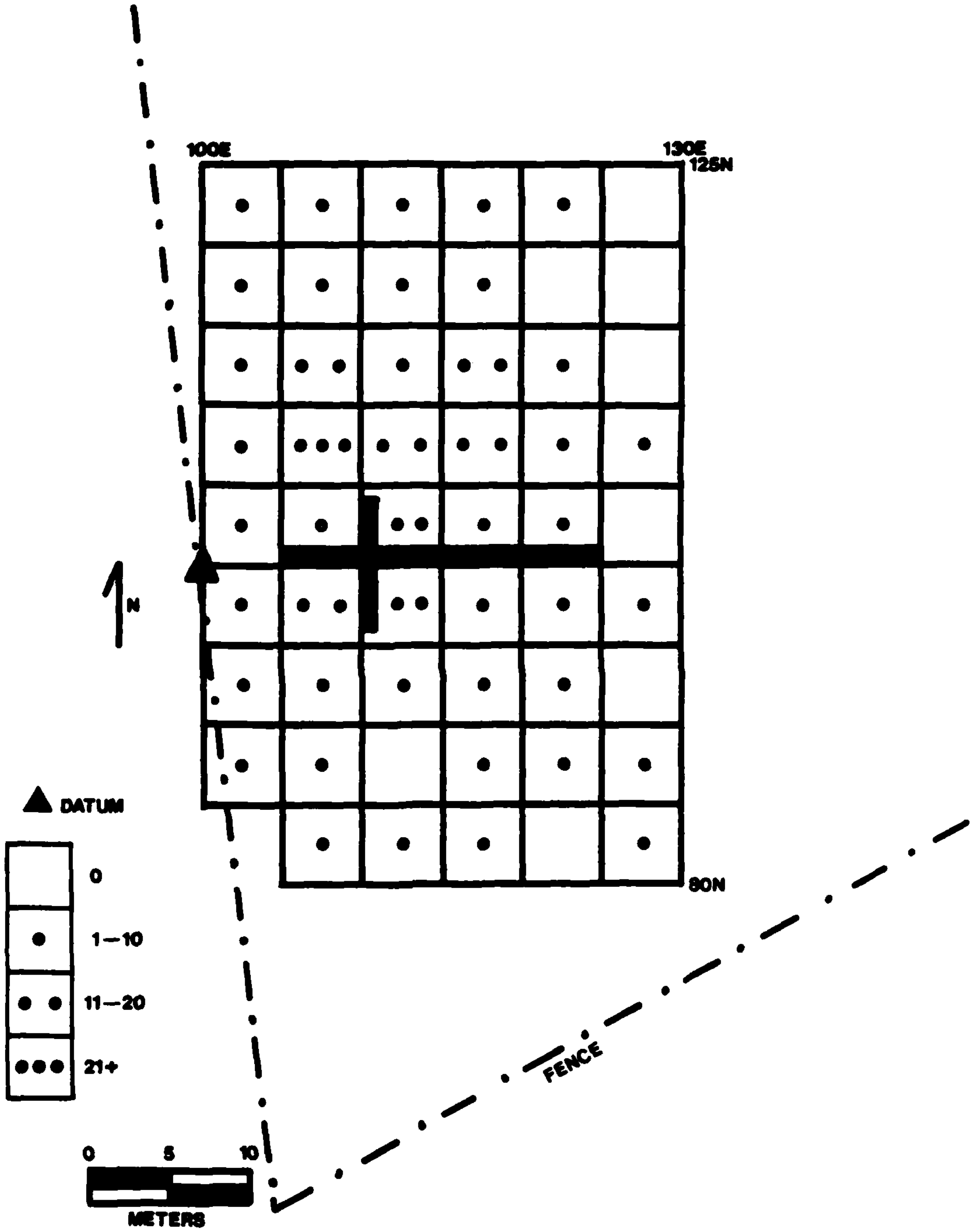


Figure 9.8. Map showing the distribution of bottle glass from the surface at 14BU1004.

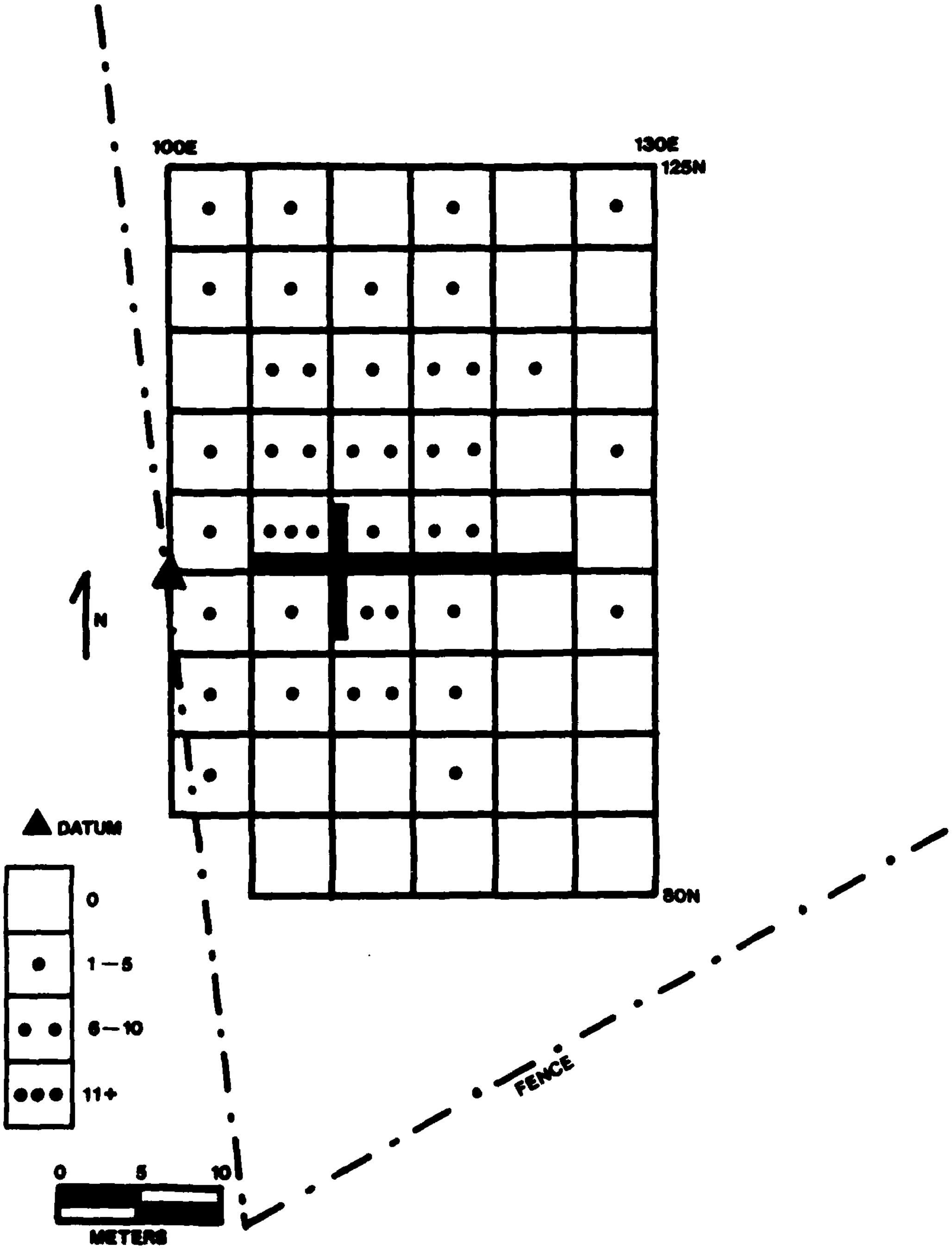


Figure 9.9. Map showing the distribution of window glass from the surface of 14BU1004.

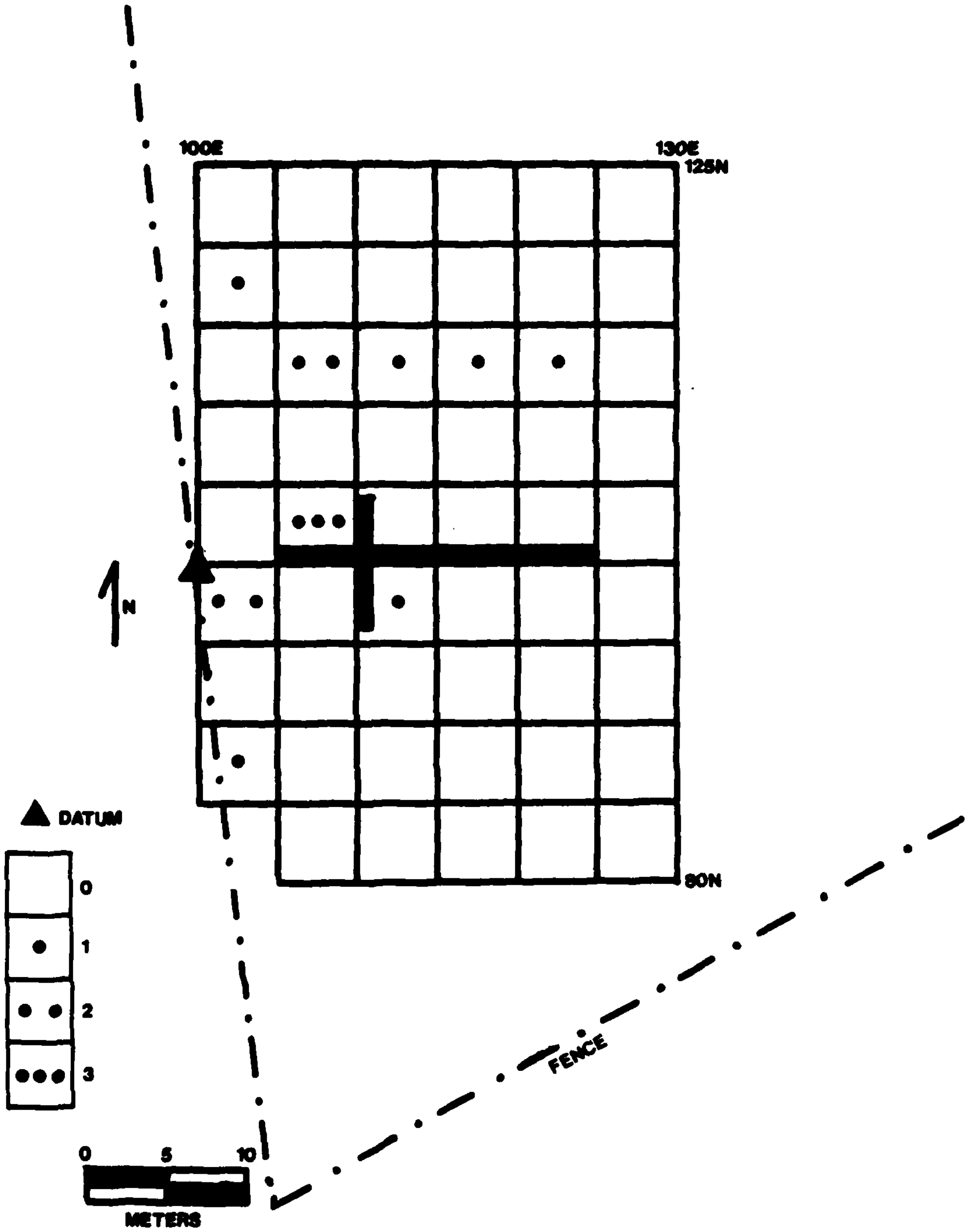


Figure 9.10. Map showing the distribution of nails from the surface of 14BU1004.

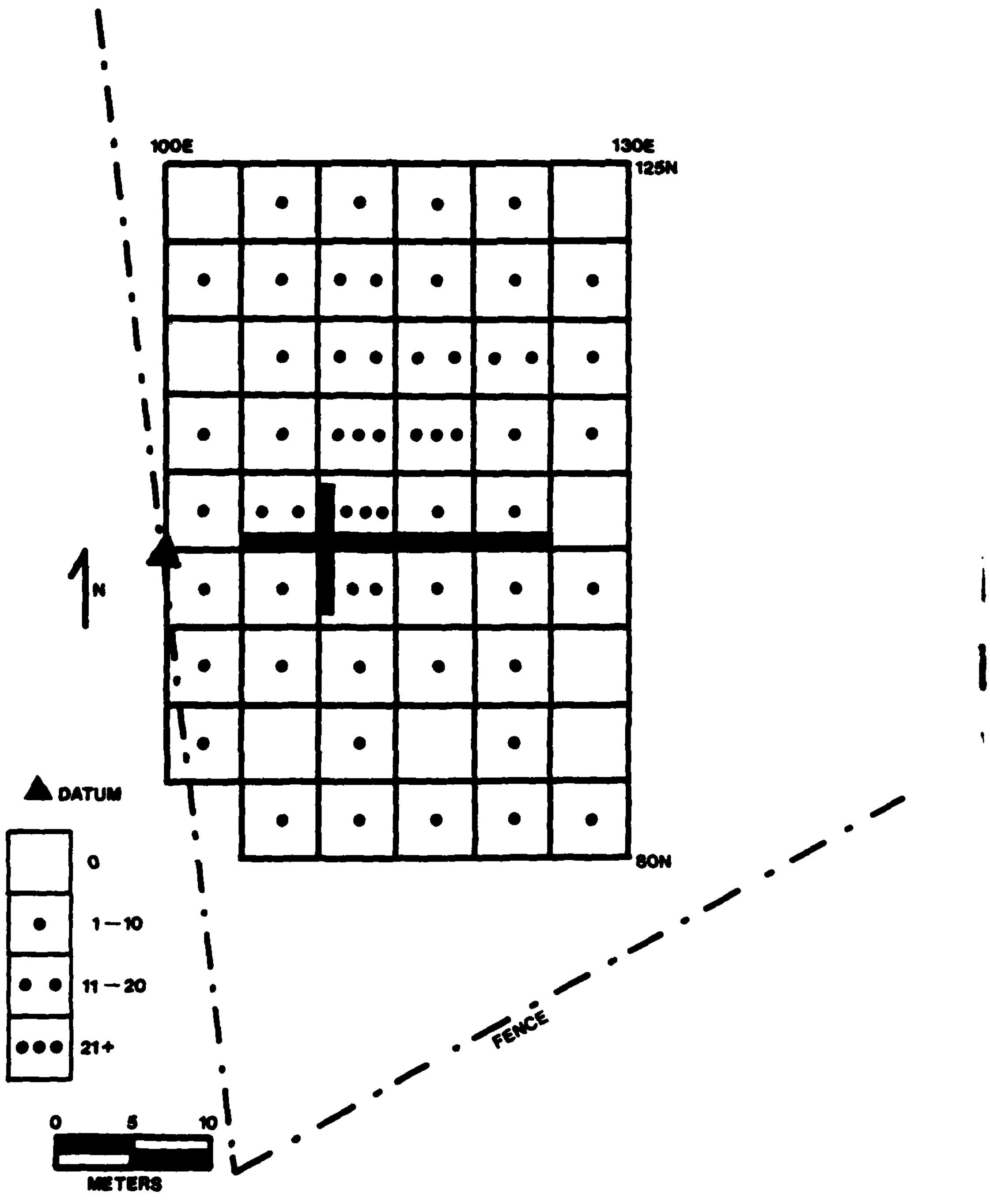


Figure 9.11. Map showing the distribution of ceramics from the surface of 14BU1004.

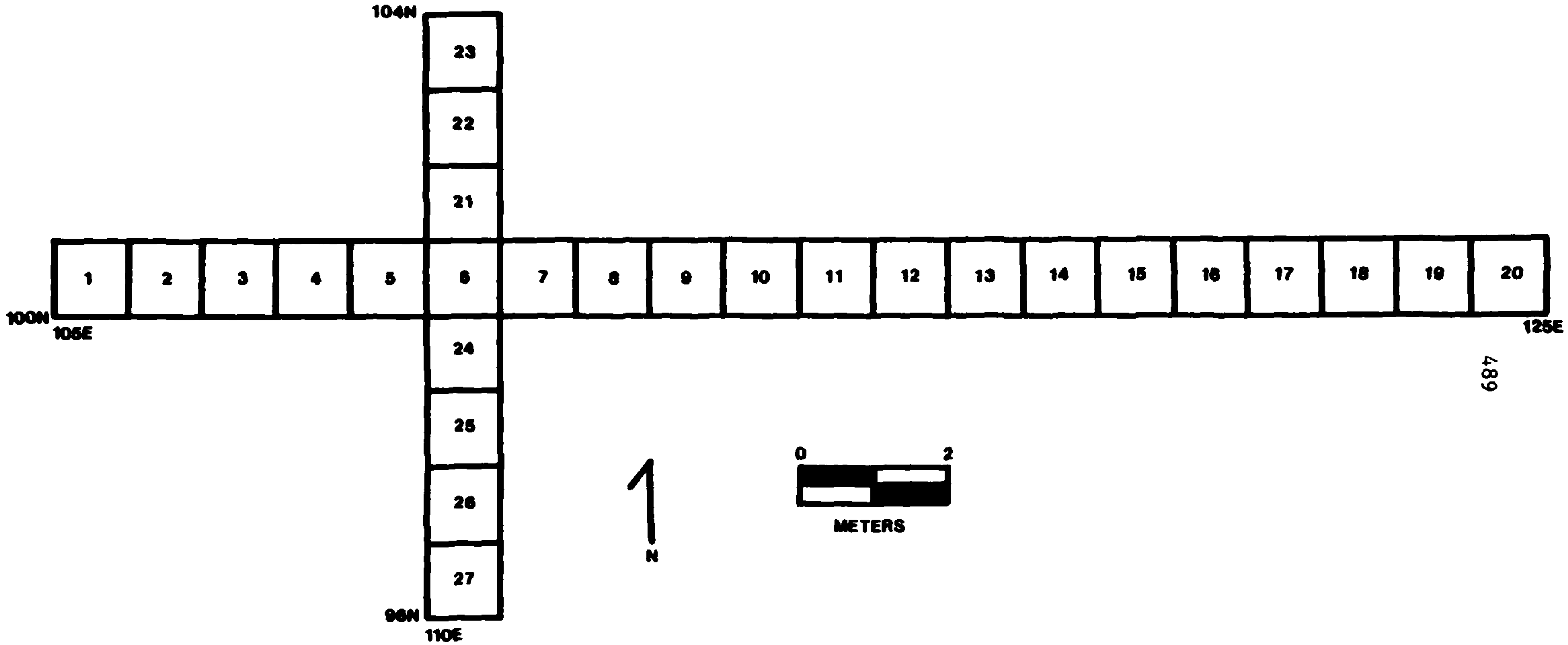


Figure 9.12. Schematic map showing the unit numbers of the excavated squares at 14BU1004.

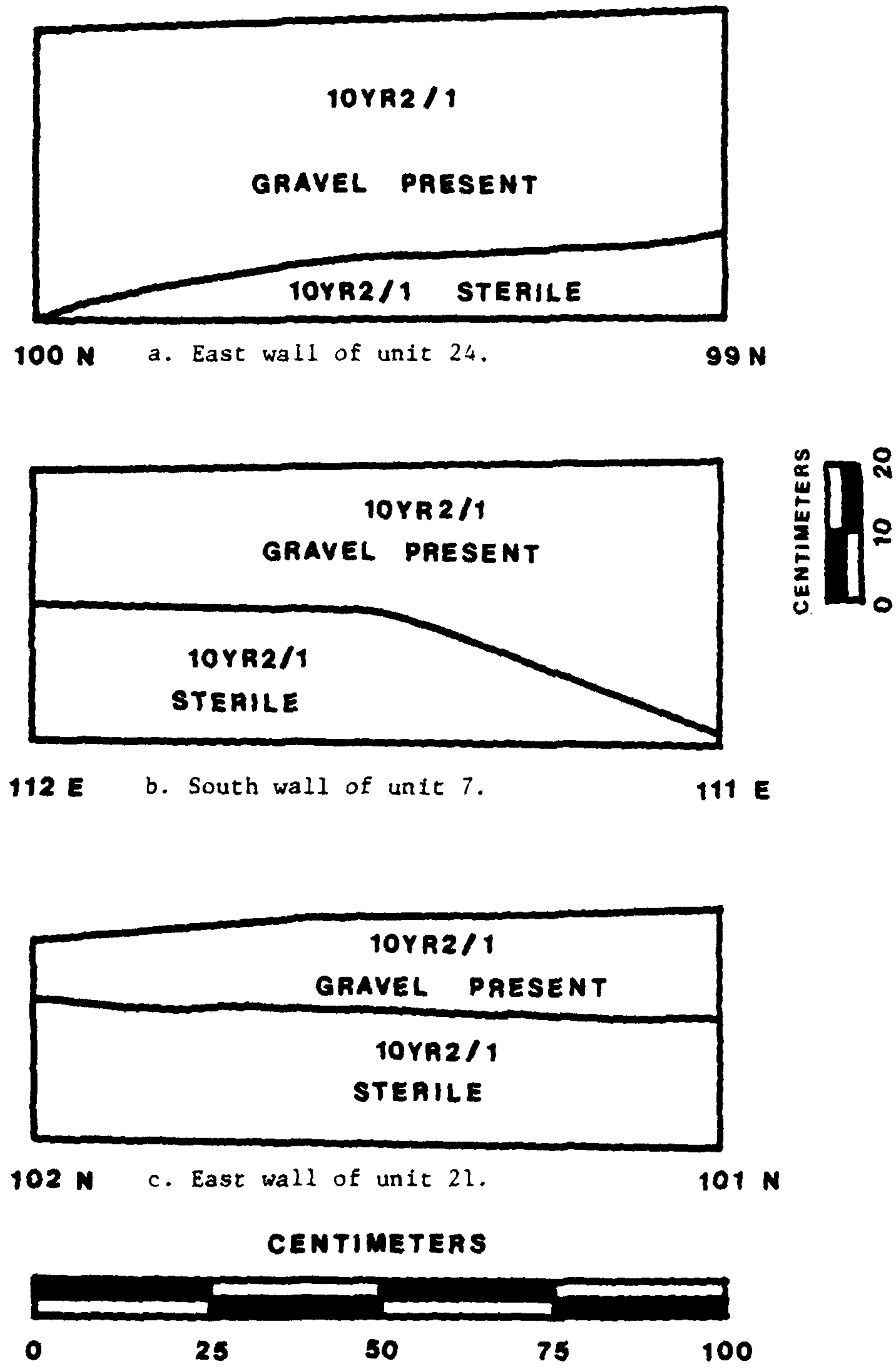


Figure 9.13. Soil profiles of three walls at 14BU1004: a. east wall of unit 24; b. south wall of unit 7; and, c. east wall of unit 21.

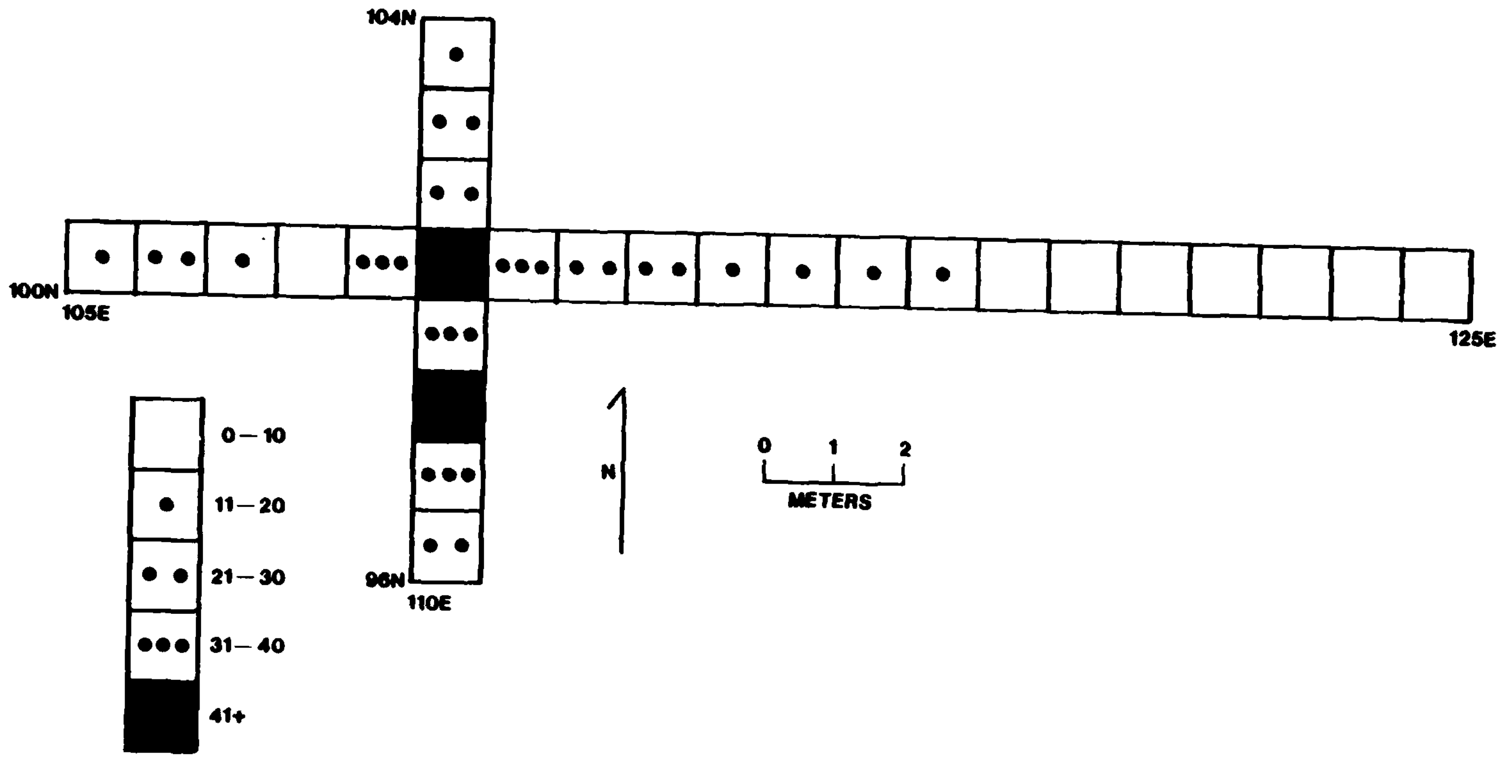


Figure 9.14. Map showing the distribution of nails within the excavated trenches at 14BU1004.

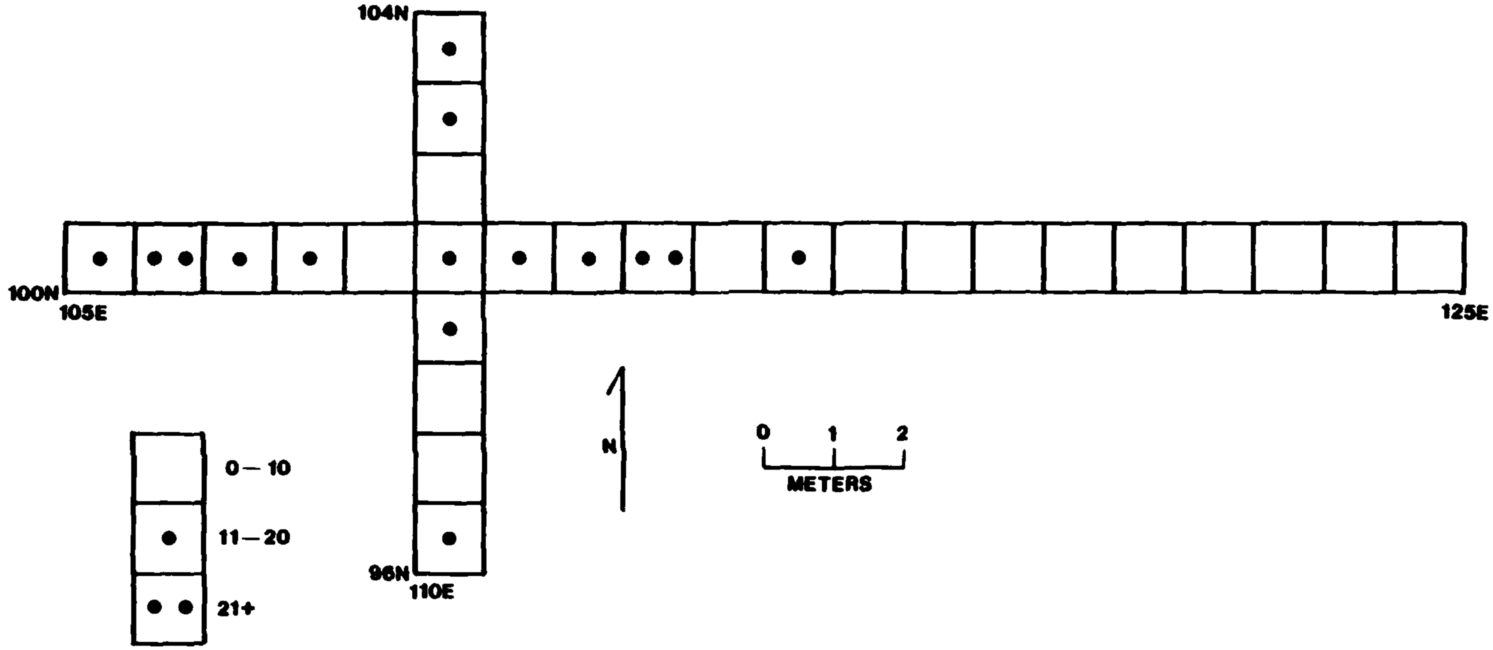


Figure 9.15. Map showing the distribution of window glass within the excavated trenches at 14BU1004.

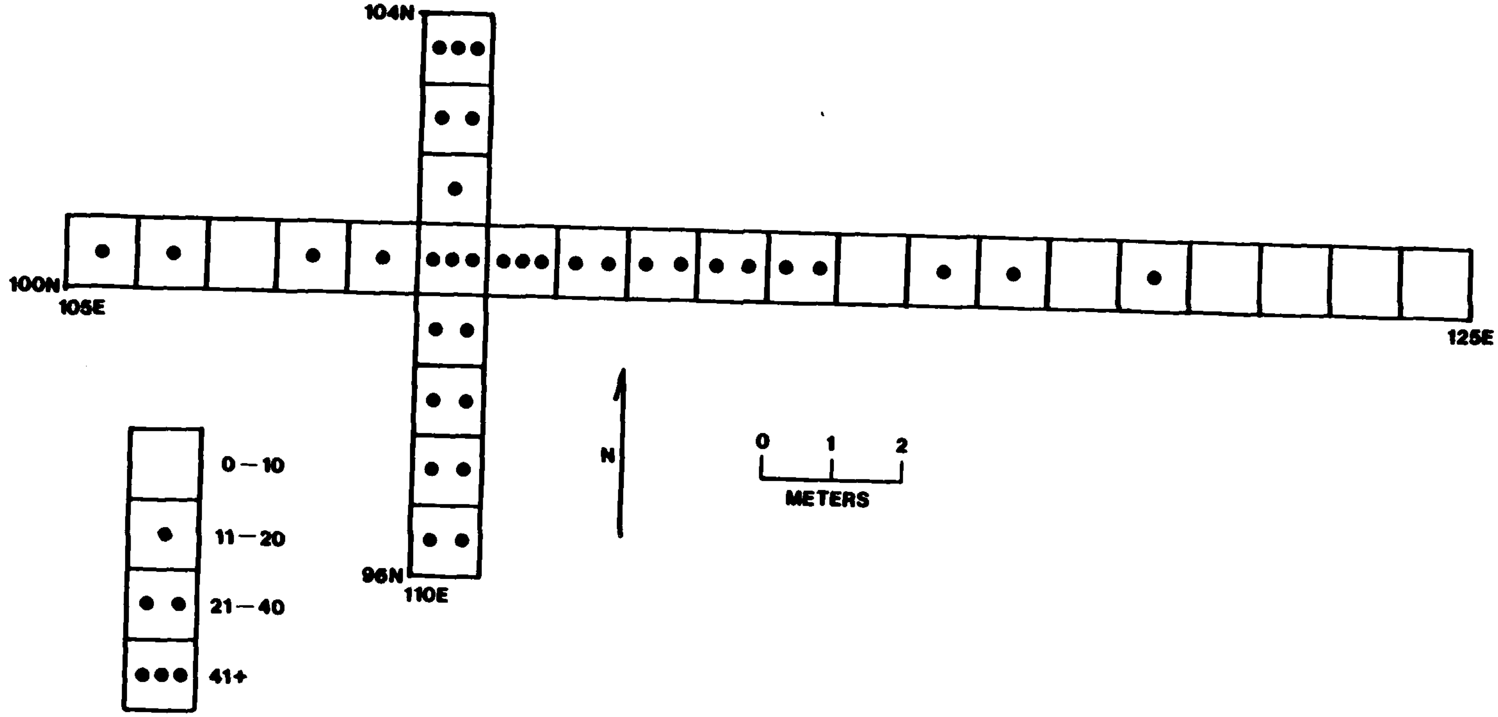


Figure 9.16. Map showing the distribution of bottle glass within the excavated trenches at 14BU1004.

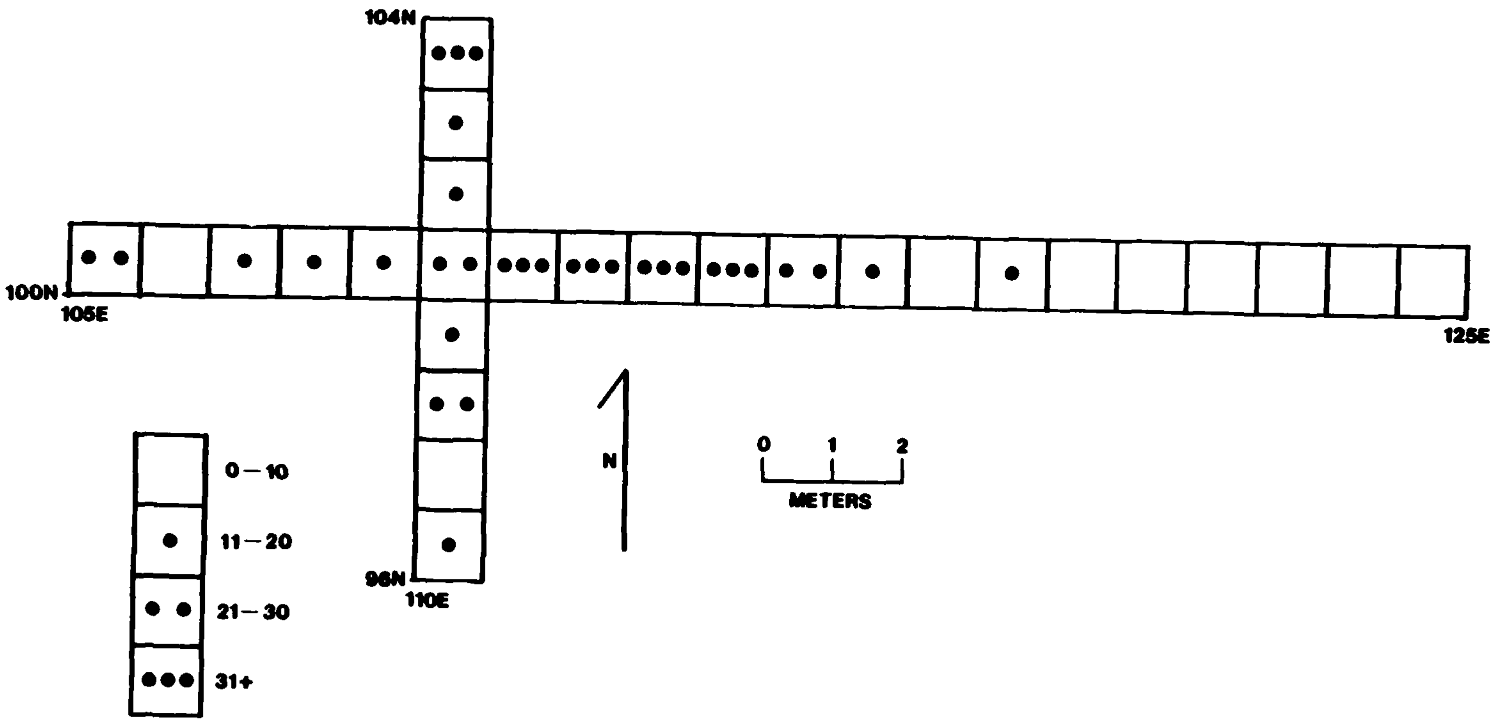


Figure 9.17. Map showing the distribution of earthenware and stoneware within the excavated trenches at 14BU1004.

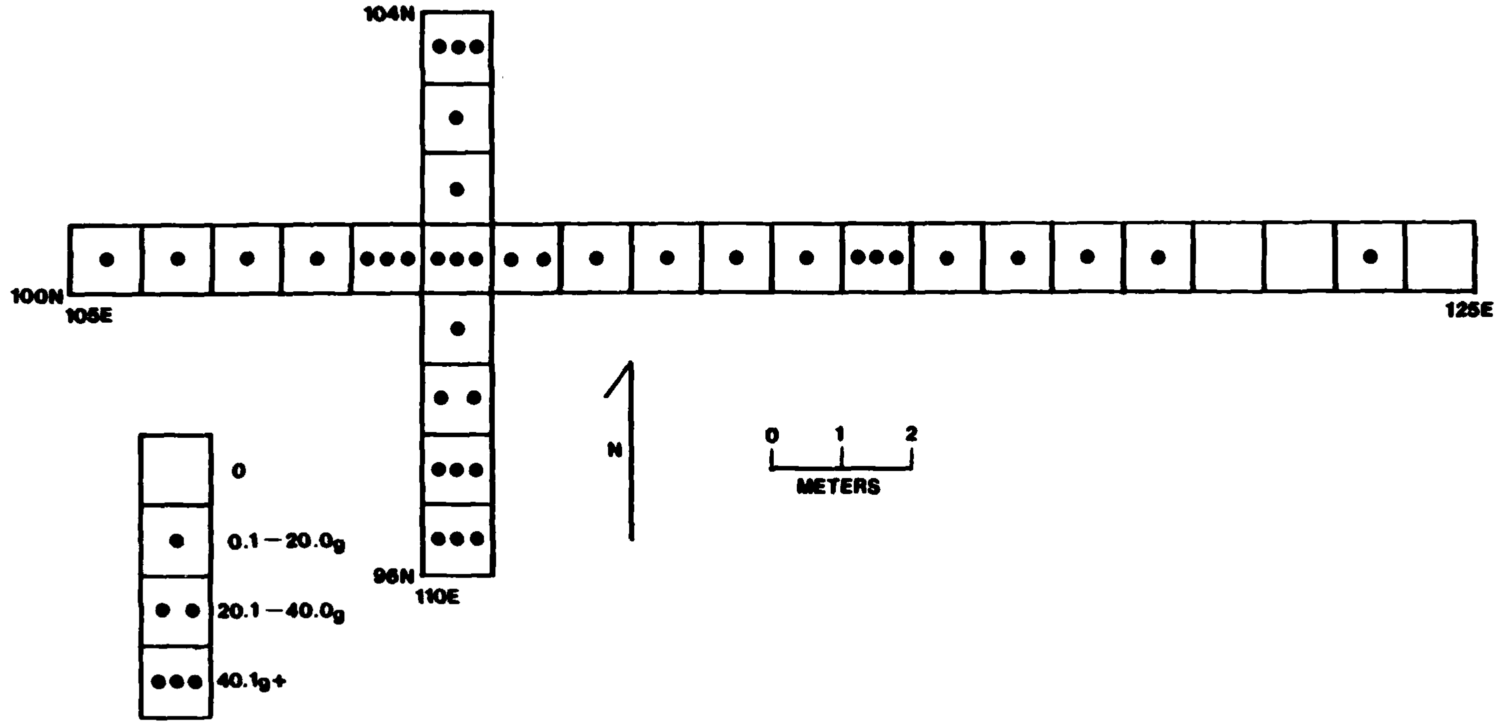


Figure 9.18. Map showing the distribution of unidentifiable metal fragments (according to weight) within the excavated trenches at 14BU1004.

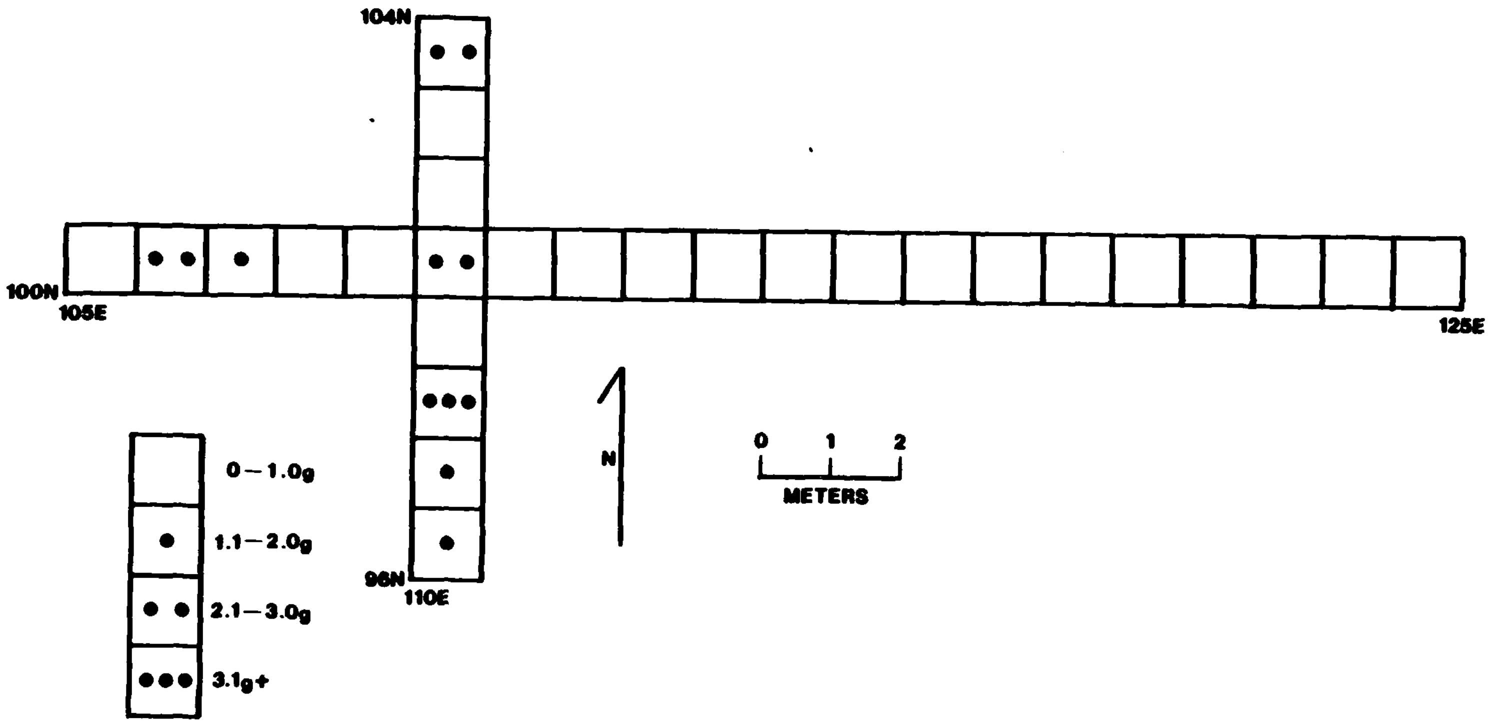


Figure 9.19. Map showing the distribution of bone (by weight) within the excavated trenches at 14BU1004.

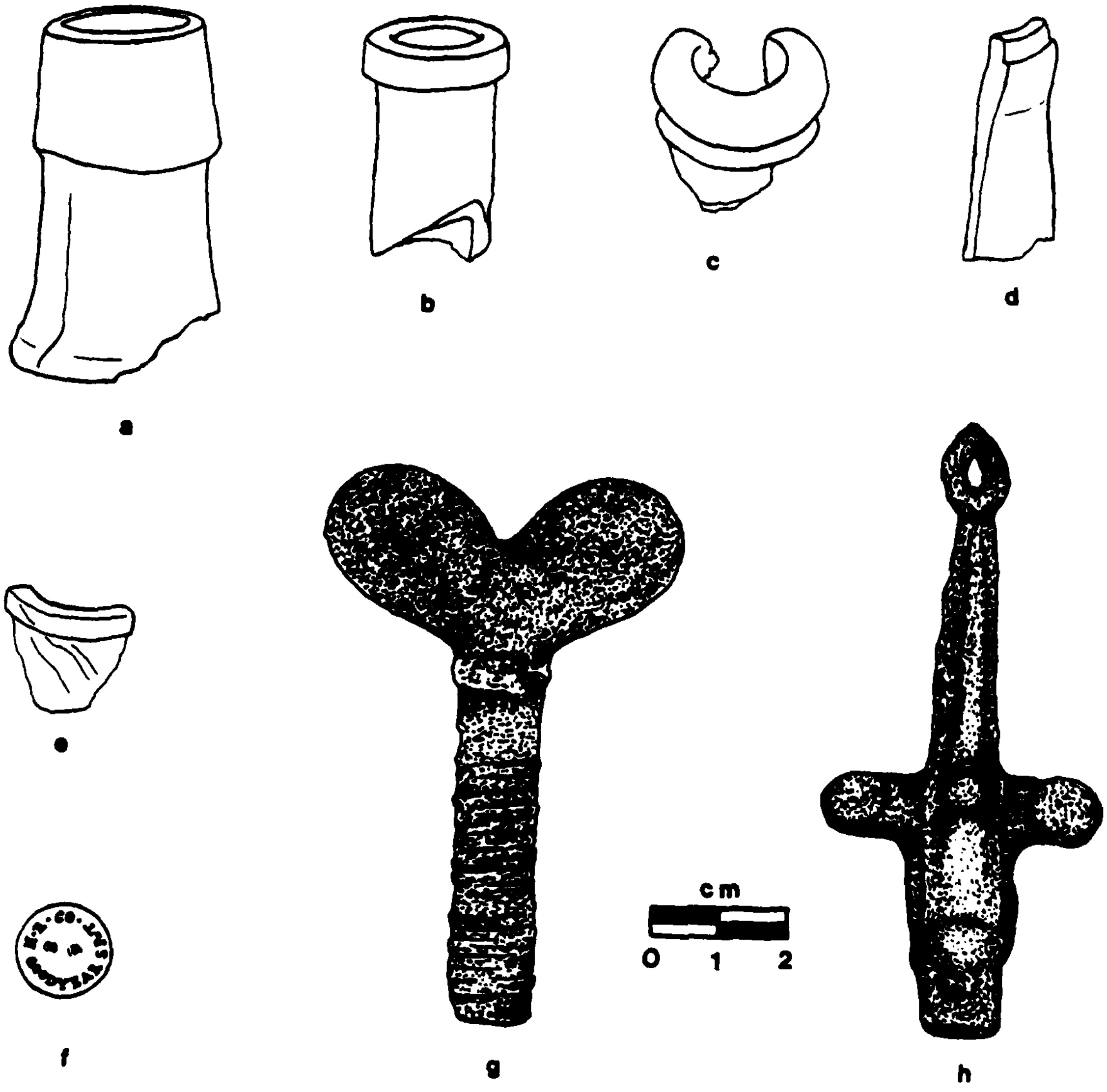


Figure 9.20 Illustrations of bottle rims and metal artifacts from 14BU1004. a. bottle rim (A90421020001); b. bottle rim (A90427020036); c. bottle rim (A90400300002); d. bottle rim (A90413020001); e. bottle rim (A90413010005); f.hard rubber button (A90422020033); g. iron wing bolt (A90423010052); h. iron door latch (A90409010110).

Figure 16 shows the distribution of bottle glass. The bottle glass is concentrated between 110 to 116 meters east and 96 to 104 meters north.

Figure 17 shows the distribution of earthenware and stoneware. These artifacts are concentrated between 110 to 116 meters east and 98 to 104 meters north. Figure 18 shows the distribution of unidentifiable metal pieces, by weight (grams), within the test trenches. The distribution of unidentifiable metal artifacts is concentrated within the short trench. Figure 19 shows the distribution of bone, by weight (grams). Most of the bone is identified as domestic chicken (*Gallus gallus*) and pig (*Sus scrofa*). On the basis of these distribution maps, nails, bottle glass, ceramics, and bone probably best describe the location of the Osborn log cabin.

Artifacts

Surface Collection (n=17)

Included in this collection are two prehistoric chipped stone biface fragments. One is made of Florence A chert and the other of Florence B chert. Ten bottle fragments were recovered. One is amber colored with threads for a screw-on lid. Five fragments are aqua in color. One is a neck with the raised letters "SYRU". This is probably a medicine bottle. A second rim fragment has a blob top (type 1) with an orifice diameter of 12.2 mm. and no discernible seam marks.

One bottle fragment, a strap handle, is of clear glass. One light manganese colored fragment is pressed glass. One milk colored fragment is an insert for a mason jar lid. It has the raised letters "JAR COMP". One curved fragment of olive green glass was also recovered. Three pieces of window glass, one clear and two with green tint, were recovered. Three square-cut nails, one size 20 d and two of indeterminate size, and one iron, circular, buckle were recovered.

Intensive Surface Collection

Ceramics

See Anderson, this volume.

Bottle Glass (n=305)

This category is further divided into eight color types: aqua (103); olive green (2); amber (19); clear (109); light manganese (26); green tint (42); sea green (4); and translucent milk (3).

There are nine large fragments of aqua colored glass which have discernible markings or characteristic features. Of these, four base fragments were recovered, two of which are rectangular. One of these rectangular base fragments has no identification markings and the other has a kickup and the raised letters "AGW". The third base is round and has a kickup. It measures 60.0 mm. in diameter. The fourth, which also has a kickup, is from a large round bottle with a diameter of 130.0 mm. Four of the nine large aqua

fragments are rims. One has a semi-blob top (type 2). The second has a packer top (type 3) and an orifice of 15.0 mm. The third rim has a packer top (type 3) and an orifice of 11.3 mm. The fourth has a blob top (type 1) with an orifice of 12.1 mm. No seam marks are discernible on this rim fragment (Fig. 20c). One aqua colored fragment has the raised letters "BUL". Additional identification marks are absent.

Two amber colored fragments were recovered. One had the raised letters "NN", and the other was a rim with a blob top consisting of four rings.

Six bottle fragments of clear glass with characteristic features were recovered from the intensive surface collection. Three of these are base fragments, one of which is octagonal with a slight kickup containing a sunburst design. The other two base fragments are round, with diameters of 70.0 mm. and 40.0 mm., respectively.

Three rim fragments of clear glass were recovered. One has a blob top (type 1), is crenated, and has an orifice of 25.0 mm. Two are straight rims from bowls.

Six light manganese colored bottle fragments were recovered. Three are base fragments. One is from a bowl and has a pressed sunburst design in the interior. The second base is from a round bottle with a diameter of 60.0 mm., and the third is from a round bottle with a diameter of 70.0 mm. Kickups are absent on these bases.

Two rim fragments of light manganese include one of a bowl or drinking glass with a straight rim (Type 4) and the other of pressed glass having an orifice of 90.0 mm. One additional piece of pressed glass was also recovered.

Window Glass (n=127)

The window glass is divided into three colors: clear (62); green tint (964); and aqua (1).

Nails (n=12)

These are all square-cut nails. They are rectangular in cross section and taper toward the distal end. These are further divided according to size:

	6d	8d	Size indeterminate
Quantity	1	2	9

Staples (n=1)

One fence staple was recovered. It is probably of recent manufacture and was used in nearby fence construction.

Tack (n=1)

One square-cut tack was recovered.

Spike (n=1)

One iron spike of the type used in log cabin construction was recovered. It measures 116 mm. long, 22.6 mm. wide, and 14.3 mm. thick (Fig. 21h).

Metal Artifacts (n=7)

Included in this category are seven artifacts: one brass button which attaches from the back and measures 7.8 mm. in diameter; one unidentifiable brass artifact; one iron belt buckle measuring 22.6 mm. wide and 2.6 mm. thick; one hand-forged, iron door hinge fragment (Fig. 21a); one hand-forged, iron pulley frame measuring 61.7 mm. long, 30.5 mm. wide, and 21.2 mm. thick (Fig. 21b); one iron strap measuring 91.8 mm. long, 33.1 mm. wide, and 7.3 mm. thick; and one unidentifiable iron tool measuring 164.0 mm. long, 27.7 mm. wide, and 13.9 mm. thick with one end square to rectangular in cross-section and the other end plano-convex (Fig. 22k).

Miscellaneous Non-Metal Artifacts (n=16)

This category includes: one piece of hard rubber weighing 2.4 grams; two fragments of bone weighing 1.6 grams; six pieces of shell weighing 2.1 grams; one piece of burned board; three fragments of charcoal weighing 0.5 grams; one large piece of burned limestone weighing 556.7 grams; one piece of plastic weighing 0.2 grams; and one basal fragment of a prehistoric, chipped stone, dart point with an expanding stem, prominent shoulders, a convex base, and made of Flint Hills Light Grey chert.

Excavated Artifacts

Ceramics

See Anderson, this volume.

Miscellaneous Iron

This category includes numerous, deteriorated fragments of iron. The combined weight of these specimens is 823.3 grams.

Horse Nail (n=1)

One size 4 d nail was recovered.

Wire

This category was divided into round wire (22.9 grams) and barbed wire (6.1 grams). The barbed wire is too deteriorated to make an identification.

Shell

A small quantity (8.5 grams) of freshwater shell was recovered.

Burned Earth

One piece of burned earth (0.1 gram) was recovered.

Charcoal

Several small fragments of charcoal (10.9 grams) were recovered throughout the excavation trenches.

Unworked Stone

This category includes pieces of limestone, chert and slate. Total weight was 363.2 grams.

Miscellaneous Iron Artifacts (n=4)

Included in this category are: one drill bit point measuring 1/5 inch in diameter (Fig. 22i); one-half of a pointed scissors measuring 120.5 mm. long, 12.1 mm. wide, and 4.9 mm. thick (Fig. 22e); one clamp used to hold leaf springs together on a horse drawn wagon or buggy seat (Fig. 21d); and one unidentifiable iron fragment measuring 95.1 mm. long and 43.1 mm. wide (Fig. 20h, Fig. 21f).

Agricultural Artifacts (n=4)

Included in this category are: one harrow spike, triangular in cross-section and measuring 102.6 mm. long and 11.4 mm. wide (Fig. 21g); one iron horse bridal ring measuring 57.6 mm. in diameter (Fig. 21c); and one complete, iron, triangular, sickle mower blade (Fig. 22d).

Bead (n=1)

One globular glass bead, with one center hole, measures 9.3 mm. in diameter and 7.2 mm. thick (Fig. 23b).

Combs (n=2)

Included in this category are one hard rubber comb tooth measuring 21.8 mm. long and one stained ivory comb tooth measuring 52.3 mm. long (Fig. 22f). The ivory tooth has discernible saw marks on one edge. The tooth is from the end of the comb.

Cartridges and Bullets (n=1)

One spent 22-caliber, rim fire, long or long rifle cartridge case with the U headstamp of the Union Metallic Cartridge Co. was recovered.

Figure 9.21. Photograph of metal artifacts from 14BU1004.
a. door hinge (A90400160001); b. pulley frame (A90400160002): c. horse bridle ring (A90423020081); d. spring clamp (A90402020019); e. belt buckle (A90421010030); f. door latch (A90409010110): g. harrow spike (A90400410001); h. spike (A90400410001); i. butterfly bolt (A90423010052): j. I-bolt (A90406030001); k. unidentifiable artifact (A90400400001).

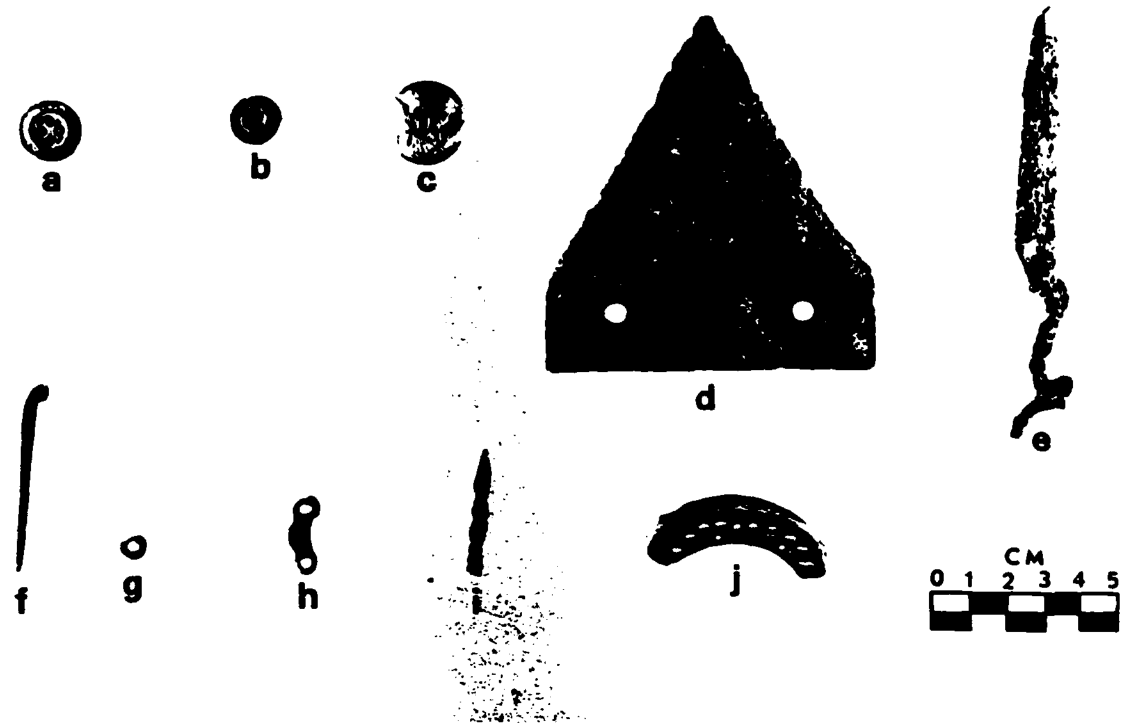


Figure 9.22. Photograph of metal artifacts from 14BU1004.
a. button (A90426020103): b. button (A90406030003):
c. Phoenix button (A90411010001); d. sickle mower blade
(A90408010001); 3. pointed scissors (A90425010059):
f. ivory comb tooth (A90425030020); g. brass eyelet
(A90405020072); h. brass watch bog (A90405020019):
i. drill bit point (A90408020026); j. brass piece
(A90406020030).

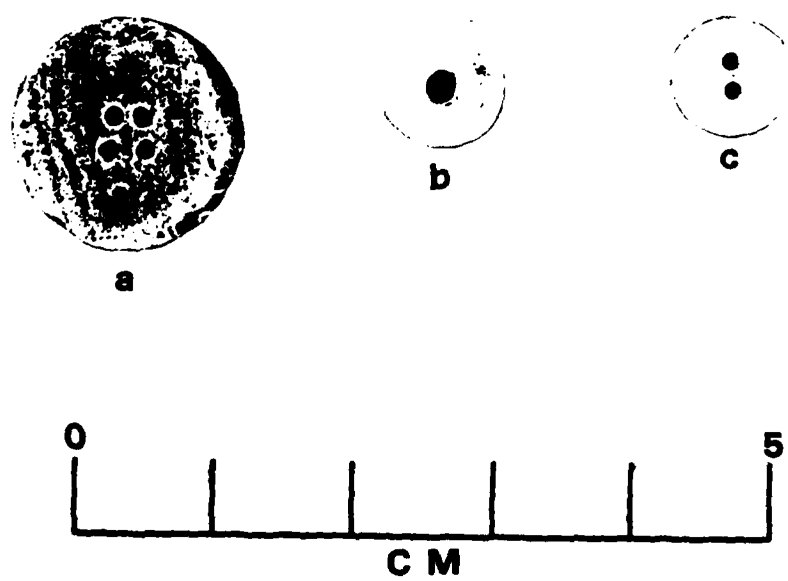


Figure 9.23. Buttons and bead recovered from 14BU1004.
a. shell button (A90423020065);
b. globular glass bead (A90425020043);
c. button made of milk glass (A90424010023).

Miscellaneous Brass and Copper Artifacts (n=7)

This category includes one small piece of copper wire with a diameter of 1.2 mm.; one brass clad, iron pipe measuring 23.0 mm. long and with an exterior diameter of 6.3 mm.; one brass washer measuring 12.2 mm. in diameter with a 4.0 mm. diameter center hole; one brass pin measuring 33.7 mm. long, 1.8 mm. wide, and 0.8 mm. thick; one brass eyelet with fragments of leather attached which is probably from a shoe (Fig. 22g); one brass, unidentifiable artifact, with two eyelets which may be from a shoe or watch bob (Fig. 22h); one brass, unidentifiable artifact with randomly placed holes and the following stamped letters: "OO ONTA OT." (Fig. 22j).

Buttons (n=6)

This category includes one white shell button with four attachment holes in the center which measures 16.3 mm. in diameter and 1.7 mm. thick (Fig. 23a): one milk glass, two hole button measuring 8.5 mm. in diameter and 2.4 mm. thick (Fig. 23c); one hard rubber, two hole button measuring 13.8 mm. in diameter and 4.7 mm. thick with the raised letters N.R. Co. / GOODYEAR SPT. on the obverse (Fig. 20f); one two-piece iron and brass button with four attachment holes in the center and measuring 17.2 mm. in diameter and 2.9 mm. thick (Fig. 22a); one fragmentary, two-piece iron and brass button with an attachment on the back (Fig. 22b); and one brass, army infantry Phoenix button measuring 23.0 mm. in diameter and 12.1 mm. thick with an attachment on the back with SCOVILL MF'G Co. / WATERBURY (Fig. 22c) stamped on the obverse, dating the button later than 1850 (Woodward 1976).

Buckles (n=5)

This category includes four iron buckles which vary in width from 22.3 mm. to 35.7 mm. and 3.4 mm. to 6.0 mm. thick (Fig. 21e). One fragment of an iron buckle was also recovered. These could either have been articles of human clothing or parts of a harness.

Bolts and Nuts (n=4)

Included in this category are: one complete, hand-forged, iron I-bolt measuring 111.7 mm. long, 32.8 mm. wide and with a 14.4 mm. diameter shaft (Fig. 21j); one complete, iron, bolt with a butterfly head measuring 84.0 mm. long and 12.4 mm. in diameter (Fig. 20g, Fig. 21i); one iron, hexagonal, 3/8 inch nut; and one fragment of a bolt shaft measuring 6.0 mm. in diameter and 31.1 mm. long.

Nails (n=533)

This category includes 532 square-cut nails of various sizes and one wire nail of indeterminant size. The square-cut nails are of the following sizes:

	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d	12d	16d	indeterminate
quantity	4	17	39	55	17	18	9	21	6	8	5	1	332

Window Glass (n=272)

This category is further divided into three color types: clear (83); green tint (181); and aqua (8).

Bottle Glass (n=567)

This category is further divided into eight color types: aqua (201); amber (67); clear (176); light manganese (53); olive green (3); green tint (62); sea green (3); and milk (2).

Several larger pieces of bottle glass have characteristic features. Two are amber colored fragments, one with the raised letter "E" and a second, a rim, with an orifice of 18.3 mm. The rim has an applied, oil finish top (type 9) (Fig. 20a). The mold seam extends to the base of the rim, placing manufacture of the bottle between 1880 and 1900 (Adams 1971).

Ten of the 201 aqua colored fragments have characteristic features. Two fragments include one round base with a pontill mark and kickup and one rectangular base with no kickup. Identification marks are absent. One fragment has the raised letters ELD'S / SYRUP and is probably a patent medicine bottle.

Seven aqua colored rim fragments were recovered. One is from a mason jar with exterior threads and an orifice of 70.0 mm. The second is a bottle rim with a recessed lip (type 6) and an orifice of 20.0 mm. The third has a packer top (type 3) and an orifice of 9.2 mm. (Fig. 20b). The fourth has an extracted top (type 7) and an orifice of 11.1 mm. (Fig. 20e). The lip has been applied, making the manufacture of the bottle at least pre-1900 (Adams 1971). The fifth has a blob top (type 1) and an orifice diameter of 15.0 mm. The sixth rim has a blob top and the seventh is a lip fragment. Both are too fragmentary to determine orifice diameters.

Six of the 176 fragments of clear glass have characteristic features. Three are straight rims (type 4) and are probably from a bowl. The fourth has an incurvate rim with a flat lip (type 6) (Fig. 20d) and the fifth has an extract top (type 8) and an orifice diameter of 15.0 mm. The sixth is a fragment of pressed glass.

Three of the 53 fragments of light manganese colored glass have characteristic features. Two are pieces of pressed glass with a sunburst design. The third is a fragment of a bowl with a straight rim (type 4).

Faunal Remains

A small quantity of bone fragments (total 21.8 grams) was recovered from throughout the test excavations. Only two bones were identifiable to species. One is a nearly complete left radius of a domestic chicken *(Gallus gallus)*, and the second is a left maxilla fragment of a domestic pig *(Sus scrofa)*. The maxilla is an anterior fragment with the P 2-4 present. The teeth appear to be deciduous.

Summary

The large quantity and variety of cultural remains recovered from the Osborn log cabin site allow the following inferences:

(1) The cabin was constructed prior to the development and availability of wire nails. The general absence of wire nails indicates the log cabin was either moved from the original location or was never modified in the latter part of the 19th century when wire nails became available.

(2) Some of the household hardware, such as door locks and pulleys were made locally by a blacksmith.

(3) Phineas Osborn or some other resident of the log cabin smoked a tobacco pipe (See Anderson, this volume).

(4) The recovery of a portion of a ceramic doll indicates a child or children were residents of the cabin.

(5) The army, infantry, Phoenix button indicates Phineas Osborn or some other adult male resident had served in the army, probably during the Civil War.

(6) The large quantity of earthenware and stoneware of large crockery vessels suggests the residents were engaged in the production of dairy products, particularly cheese.

(7) The low frequency of high status items, such as porcelain wares and items manufactured of brass and copper, indicate the general low economic status of the residents.

(8) On the basis of seam marks on two bottle fragments, the site was not occupied after 1903.

14BU1008 - The Donaldson House

The Donaldson house, 14BU1008 (Fig. 24) is situated on the floodplain of Durechen Creek. The area immediately around the site is in pasture and cultivation. The site is to be inundated by El Dorado Lake.

History

The cut limestone house at 14BU1008 was built by George T. Donaldson in 1869 and used as a family dwelling until 1974. George Donaldson was born in Mushingham County, Ohio and moved to Jefferson County, Kansas in 1855 (Andreas 1883:1450). He took an active part in sustaining free-state principles in Kansas.

Donaldson moved his family to Butler County in 1857 and joined a small

Figure 9.24. Aerial photograph of 14BU1008, the Donaldson Stone House and the areas where test excavations were conducted.

band in Emporia that would eventually settle the town of Chelsea. The Donaldsons selected a farm near Durechen Creek and constructed a log cabin which they occupied until 1869. Donaldson expanded his farm to include finally 800 acres, part of which was the site for the town of New Chelsea (Fisher 1930:33).

Donaldson began construction of the presently standing stone house in 1869. The stone house stands north and east of the original log cabin and was apparently near completion at the time of George Donaldson's death on November 3, 1869 (Stratford 1934:24). Mrs. Donaldson and her family continued to reside in the stone house until her death in 1883 (Walnut Valley Times, August 31, 1883). In 1883 the ownership of the house was transferred to J. S. Saxby, the first minister to serve the Chelsea community in the late 1850's. Between 1886 and 1905 the property was owned by T. W. Holderman. At least one tenant family, the Sontag's, lived there during Holderman's ownership. In 1946 Glen Lucas, with his brother Avery, bought the farm and lived in the house until 1973 when the U. S. Army Corps of Engineers purchased the property (Site Survey Form, 1978).

The Donaldson stone house is a two story, north facing limestone structure. Wall construction is not solid; two walls (inner and outer) were constructed of semi-finished cut limestone reinforced by saw-milled beams and cement. Rubble fill was placed between the inner and outer walls. The corners of the house are quoined, with the width of the walls varying from 45 cm. to 60 cm. (Roberts and Wilk n.d.).

This site is significant because of its long history in the area, having been built by one of the earliest and most prominent settlers in Butler County. Further archaeological investigations were warranted for this site in order to obtain a representative sample of artifacts which would allow interpretations to be made as to the economic status and networks operating in the area for 104 years (1869-1973).

Surface Collection

Upon initial examination of the site in 1979, a medicine bottle of light manganese colored glass and one .25-20 spent cartridge case were recovered from exposed soils on the east side of the house.

Test Excavations

With the aid of infra-red areal photographs, it was determined that two rectangular areas, east and north of the stone house, would most likely yield cultural materials helpful in determining past economic activities and social status of previous residents. The infra-red areal photographs depicted disturbed soils in these two rectangular areas, suggesting refuse disposal areas or places where old out-buildings once stood (Fig. 24).

These two areas were in tall grasses and weeds, so mowing was our first step in studying the site. A datum marker (100 meters east, 100 meters north, 0 meters vertical) was established on what was believed to have been the northeast corner of the yard surrounding the house. All subsequent provenience information was related to this datum. A Cartesian coordinate grid was superimposed over the site. Initial test excavations consisted of a single north-south trench, one meter wide and 10 meters long, along the 100 meter east line and extending from 82 to 92 meters north (Figs. 25 and 26). This initial trench was placed in the eastern area interpreted as having disturbed soils.

Prior to the excavation of a unit, the ground surface elevation in the southwest corner of the unit was determined relative to the datum. A total of 32, one meter square, units were dug. The initial 1 by 10 meter trench was dug to a depth of 30 cm. Most cultural remains diminished in frequency at 20 to 30 cm. The large quantity of cultural remains recovered from the trench warranted expansion of the trench in easterly and westerly directions.

Two features were exposed (Fig. 27). Feature 1, a hearth, was located in excation unit one (Fig. 28a) at a depth of 19 cm. below surface. It consisted of charcoal flecks. The hearth was circular (21 cm. in diameter) and was basin shaped (8 cm. deep). Preservation was fair with some tree root disturbance. One identifiable cultural artifact, a fragment of amber colored bottle glass with the raised letter BEGGS DEL is probably a patent medicine bottle sold by Begg's dating between 1885 and 1900 (Baldwin 1973:61).

Feature 3 (Fig. 28b), a post stain and supporting stones, was encountered in excavation unit 13. The feature consisted of rock and brick fragments placed around what appears to have been a 17 cm. diameter post. The feature was circular in shape, measuring 51 cm. in a southwest-northeast direction and 41 cm. in a northwest-southeast direction. The vertical depth of the post stain extended 55 cm. below the ground surface. Preservation of feature three was excellent with no discernible rodent or tree root disturbance. Adjacent to the rock and brick concentration was a round, one gallon, iron container with a wire handle. The container was standing upright. It measures 21 cm. high and 16 cm. in diameter. The base of the container was 30 cm. below ground surface.

Upon completing units 1-15 to a depth of 30 cm., a second trench was dug north of the stone house in an area believed to have been disturbed soils. A 1 by 8 m^2 trench was located along the 91 north meter line, extending from 80 to 88 meters east within the Cartesian coordinate system (Fig. 26). Excavation units 16-22 were dug to a depth of 20 cm. One excavation unit, number 23, was dug to a depth of 40 cm. The general lack of cultural remains did not warrant further excavation in the north test trench.

Excavations were expanded in the original test trench east of the stone house. An additional 9 m^2 were dug (Fig. 26). Since it was previously determined that cultural remains were concentrated within the first 20 cm., these nine additional units were excavated to a depth of 20 cm.

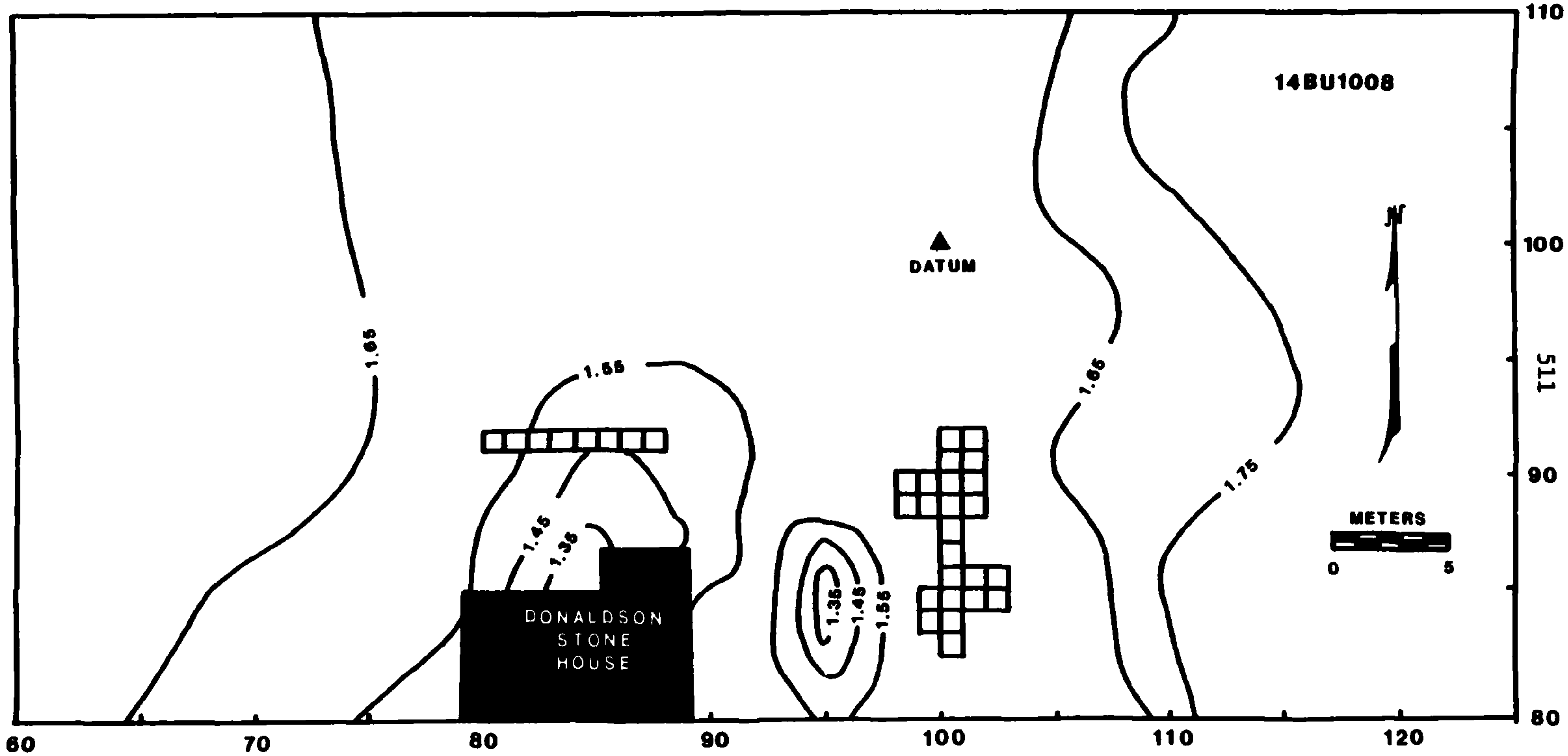


Figure 9.25. Topographic map of 14BU1008, the Donaldson Stone House.

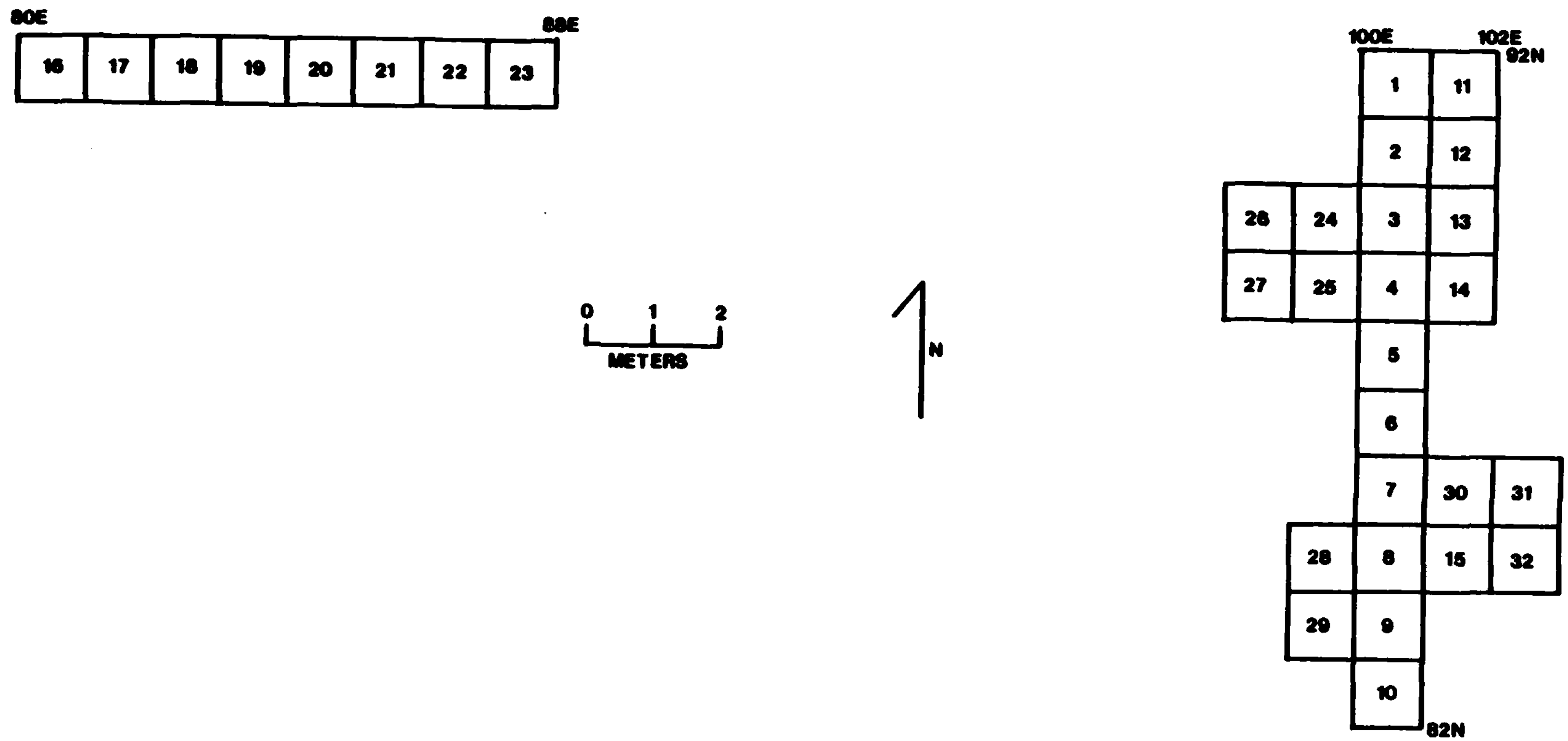


Figure 9.26. Schematic map showing the unit numbers of the test units excavated at 14BU1008.

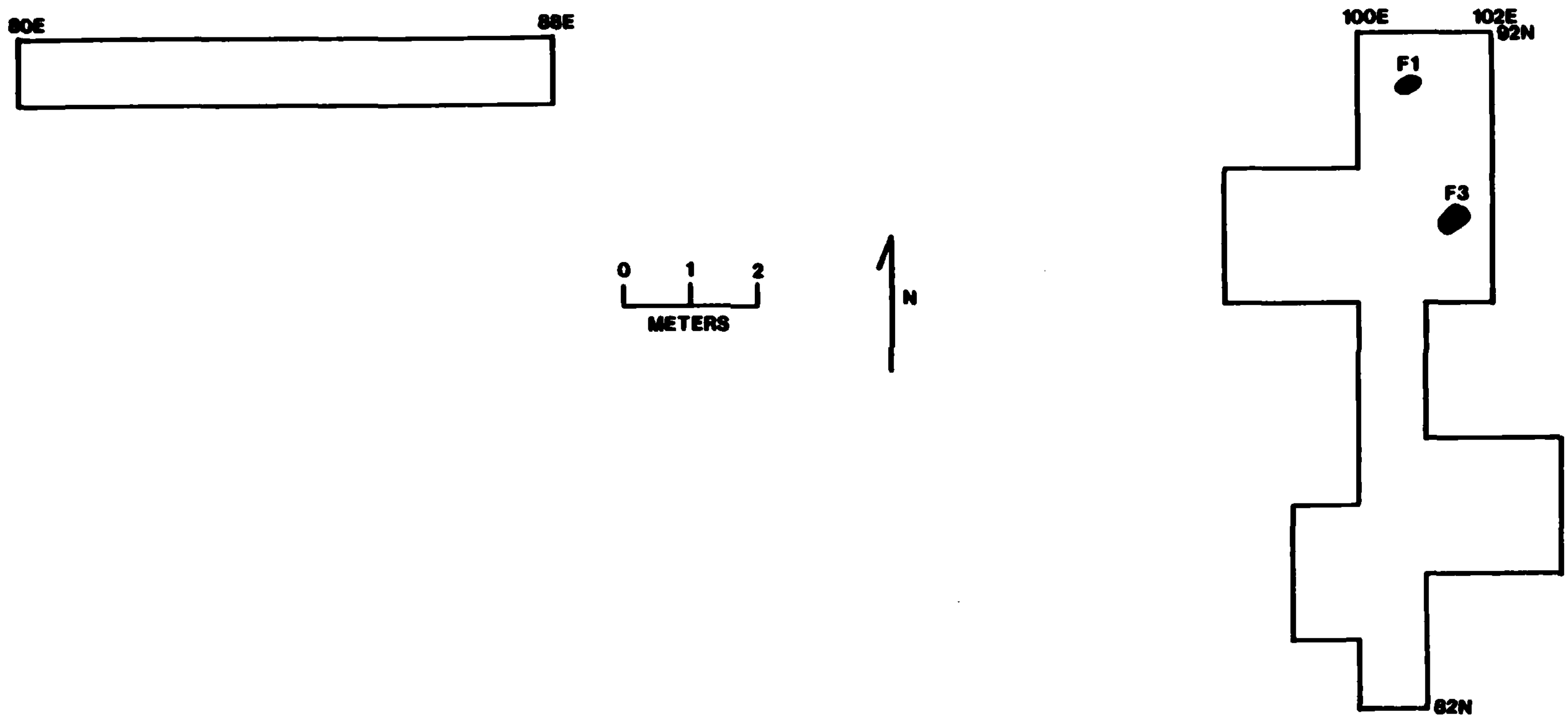


Figure 9.27. Map showing the location of features at 14BU1008.

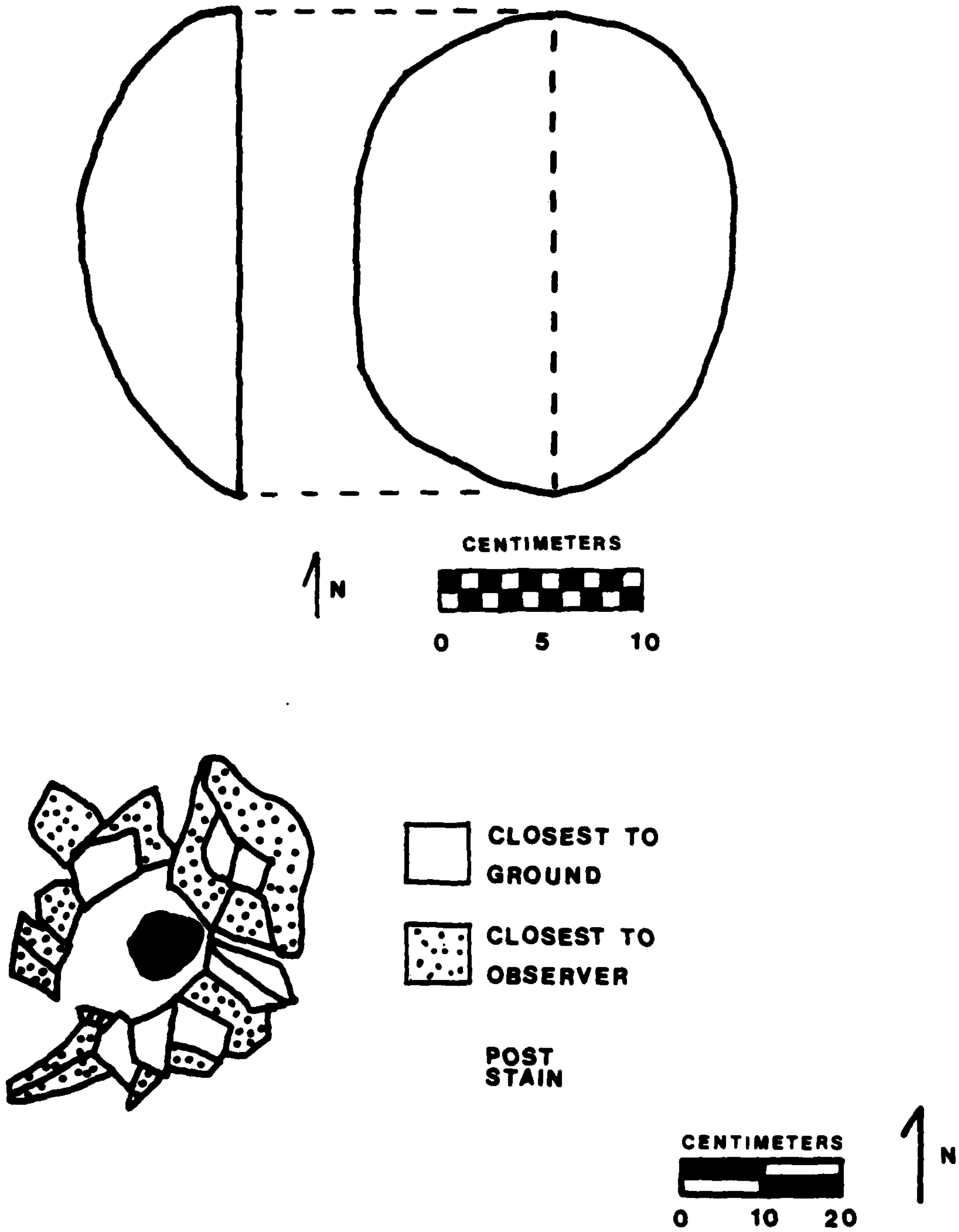


Figure 9.28. Schematic maps showing the configurations of the two features at 14BU1008. a. feature 1, b. feature 3.

These excavations yielded large quantities of cultural remains, consisting mostly of bottle glass, window glass, ceramics, nails, plastic and personal items such as buttons, belt buckles, and girdle and suspender fasteners.

Figures 29 to 37 show distributions of some of the more numerous artifact types within the test excavations. Figure 29 shows the distribution of square-cut nails. Most square-cut nails occur in the south half of the east excavation. In contrast, wire nails (Fig. 30) occur throughout the excavation.

Figure 31 shows the distribution of window glass. Most window glass occurs in the southern portion of the excavation, similar to that of square-cut nails. Figure 32 shows the distribution of bottle glass. Most occurs in the south half of the excavation.

Figure 33 shows the distribution of earthenware and stoneware. Most of these ceramics occur in the south half of the excavation. Figure 34 shows the distribution of porcelain, a high social status item. Ceramics appear to be dispersed throughout the excavation.

Figures 35 to 37 show the distribution of firearm cartridges, cases and bullets. The distribution of .22 caliber, 12 and 10 gauge shotgun cartridges, cases, and bullets are dispersed throughout the excavation while the distribution of center fire, .32 and .25-20 cartridge cases, is limited to the south half of the excavation (Fig. 37). Since cartridge cases are rarely saved and are most often left at the place of their firing, the area of the east excavation appears to have been an ideal location for the shooting of firearms, presumably at targets farther east or south.

The distribution of metal artifacts, bricks, bone, and other cultural remains do not form clusters within the excavation areas. Identification of the bones indicate domestic chicken (*Gallus gallus*), mallard duck (*Anas platyrhynchos*), toad (*Bufo sp.*), domestic dog (*Canis familiaris*), muskrat *Ondatra zibethicus*), raccoon (*Procyon lotor*), and turkey (*Meleagris sp.)* were disposed of at the site. The chicken and raccoon bones have discernible cut or butcher marks, indicating these animals were butchered and probably eaten.

On the basis of the distribution maps, it can be inferred that the larger excavation is located within a refuse dumping area which was at one time the location of some form of wooden structure. Unfortunately, this refuse disposal area appears to have been used for a long period of time. Only a few of the bottles and ceramic artifacts are identifiable as to time and place of manufacture. This reduces the ability to reconstruct economic networks operating in the area during the time of site occupation. The hearth, Feature 1, probably represents a backyard cook-out. The large quantity of cultural remains will allow inferences to be made about the health, economic, and subsistence patterns of some of the peoples who lived in the Donaldson stone house.

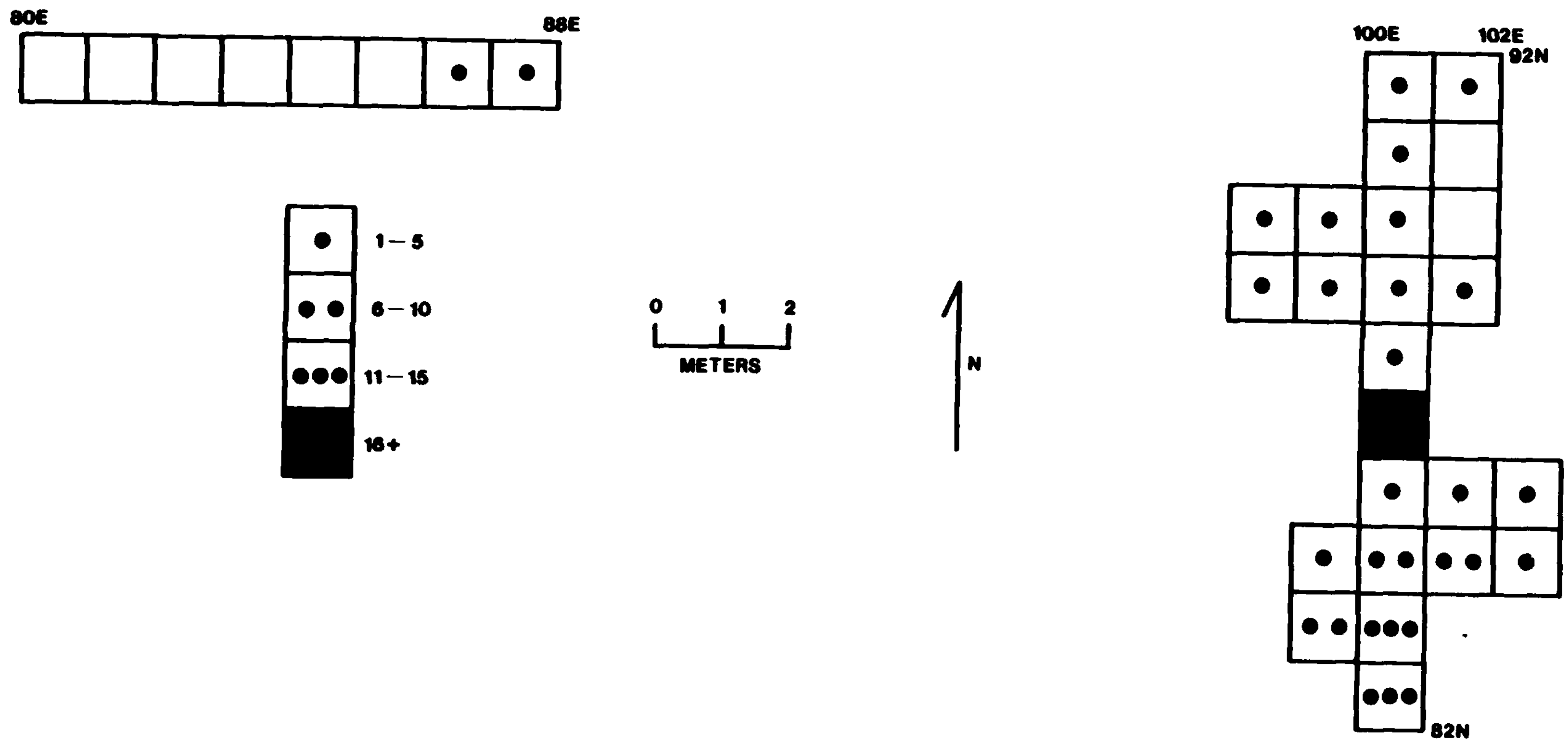


Figure 9.29. Map showing the distribution of square-cut nails within the test excavations at 14BU1008.

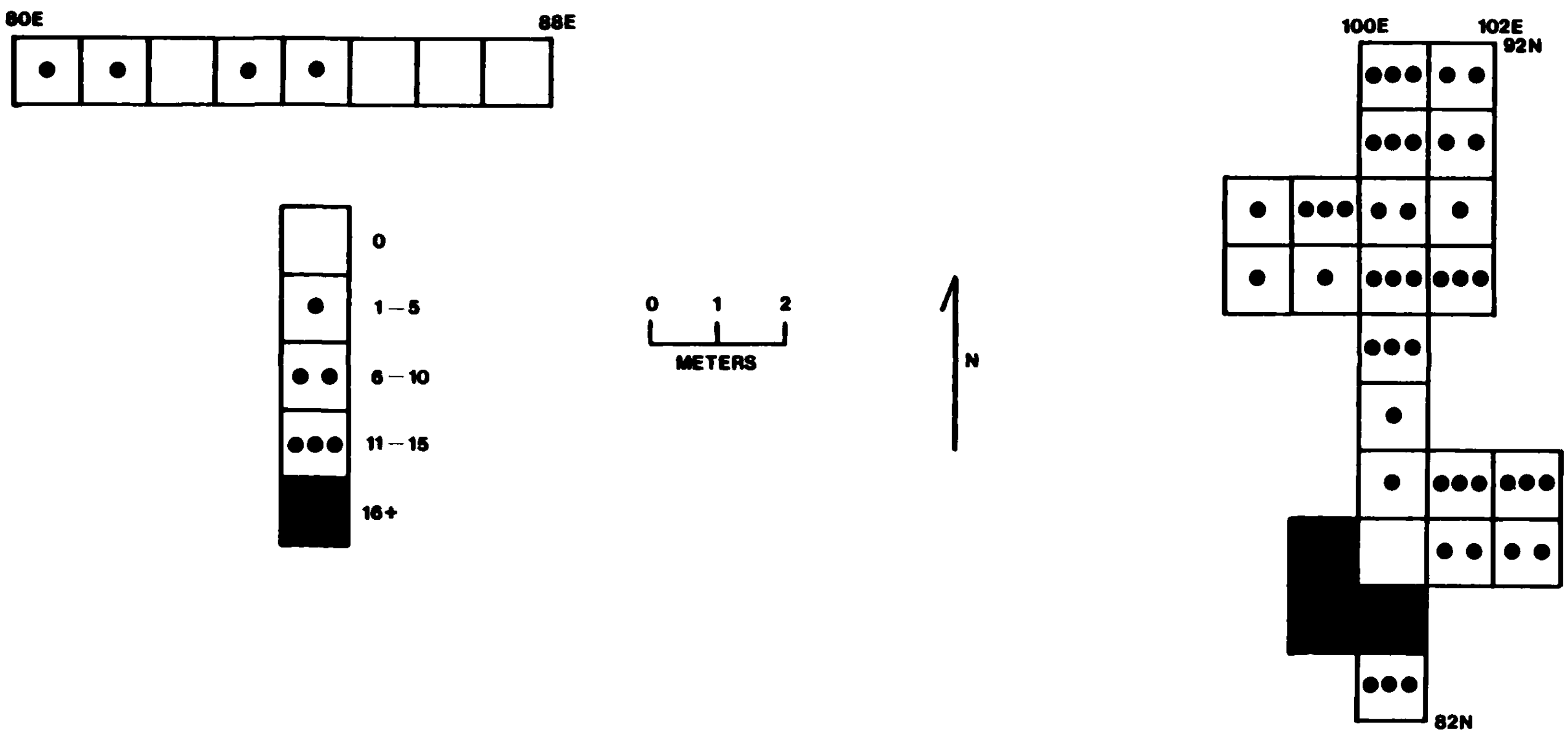


Figure 9.30. Map showing the distribution of wire-cut nails within the test excavations at 14BU1008.

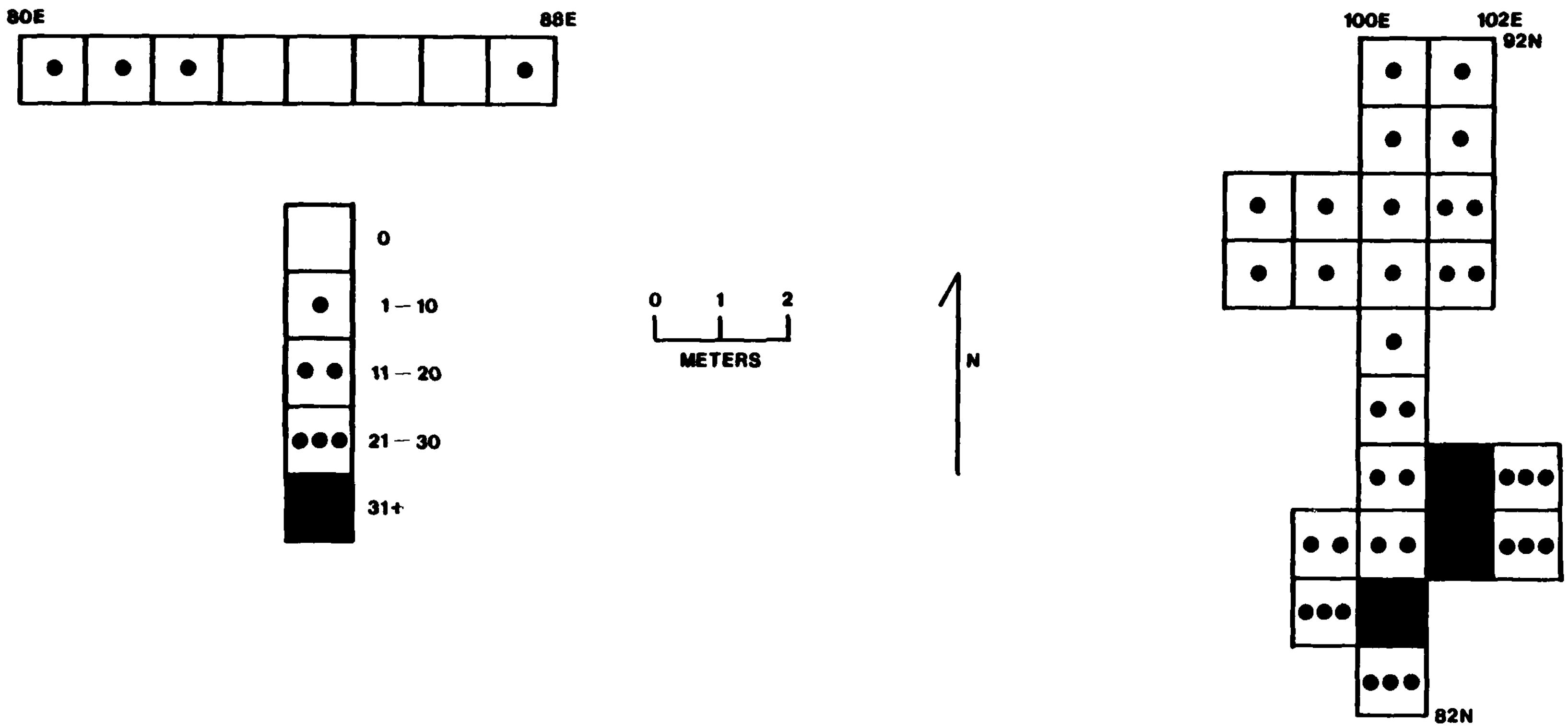


Figure 9. 31. Map showing the distribution of window glass within the test excavations at 14BU1008.

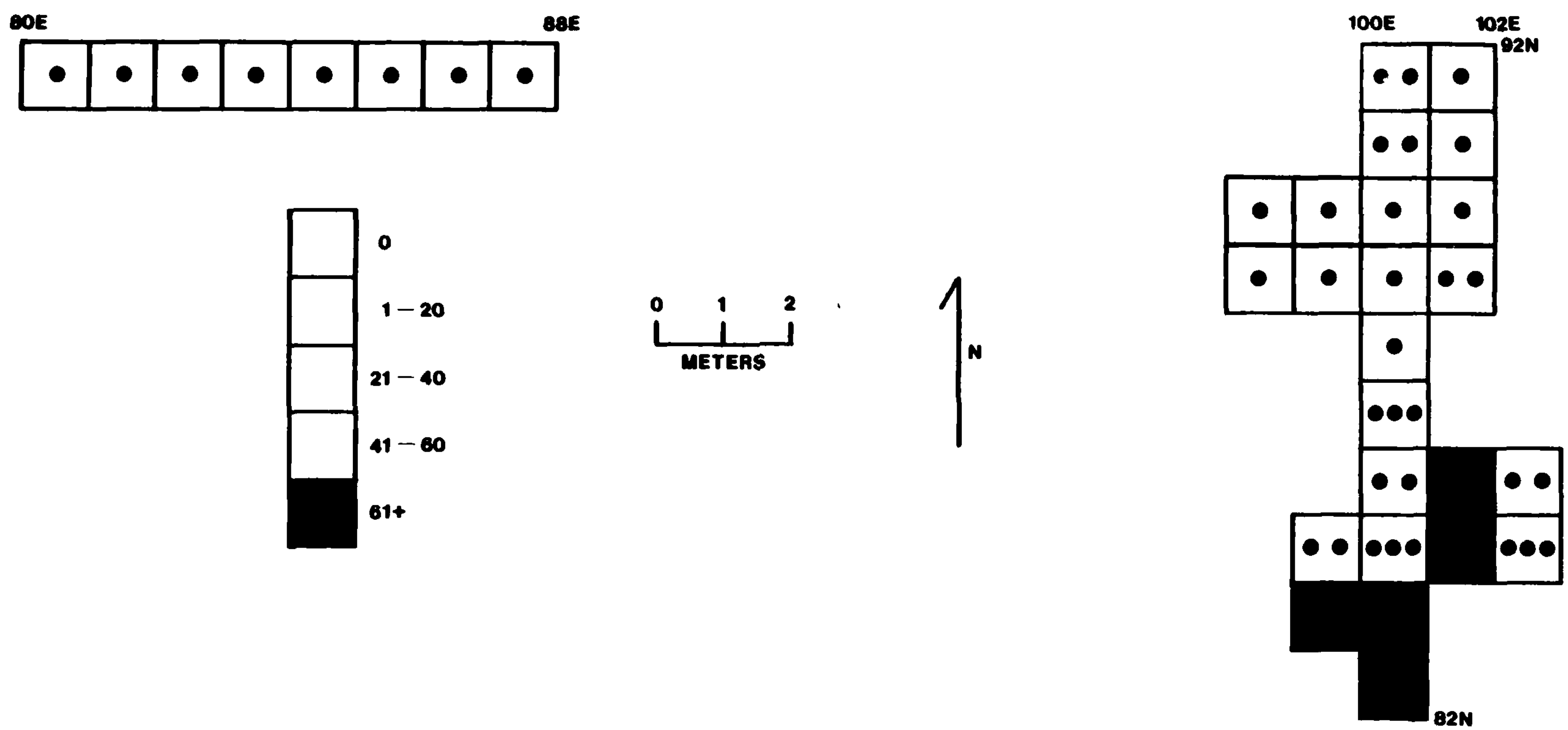


Figure 9.32. Map showing the distribution of bottle glass within the test excavations at 14BU1008.

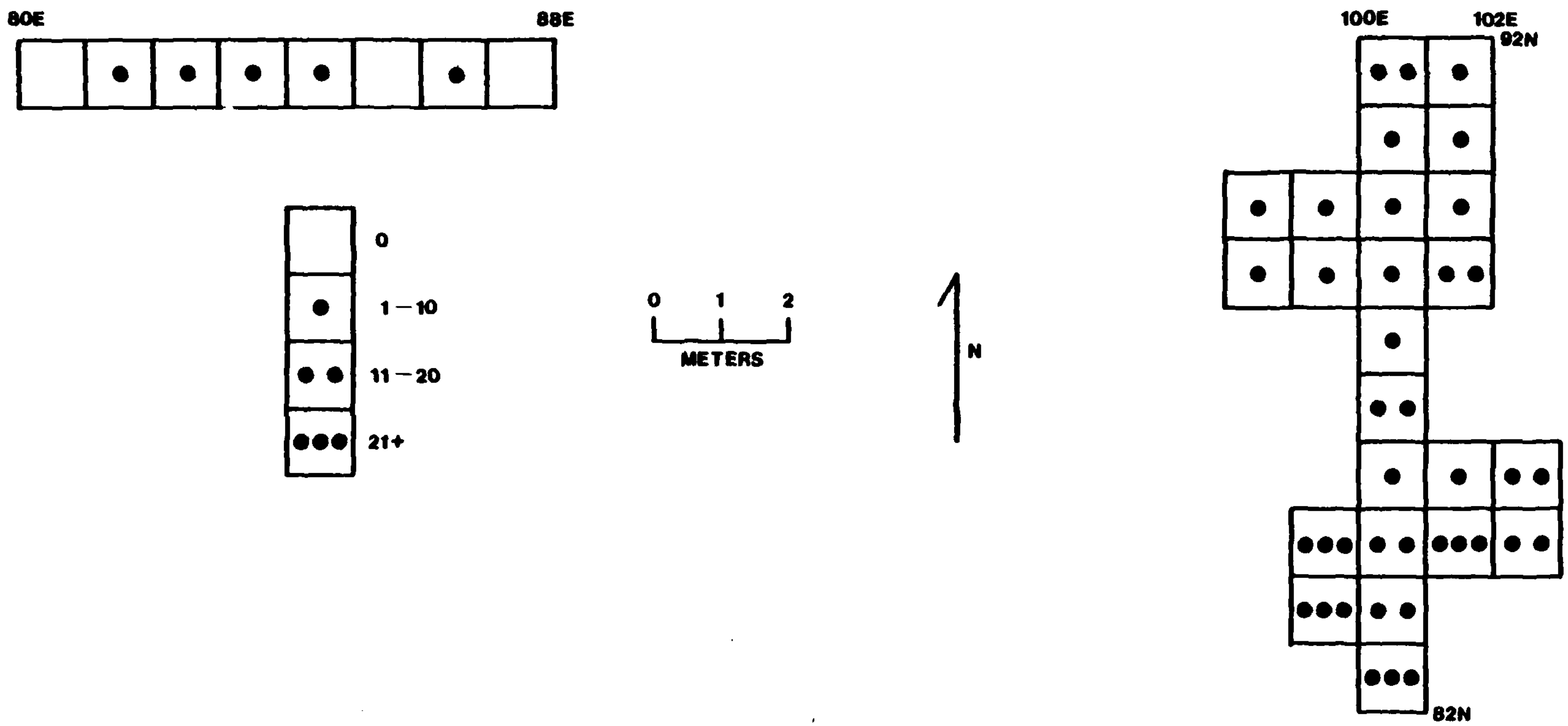


Figure 9.33. Map showing the distribution of earthenware and stoneware within the test excavations at 14BU1008.

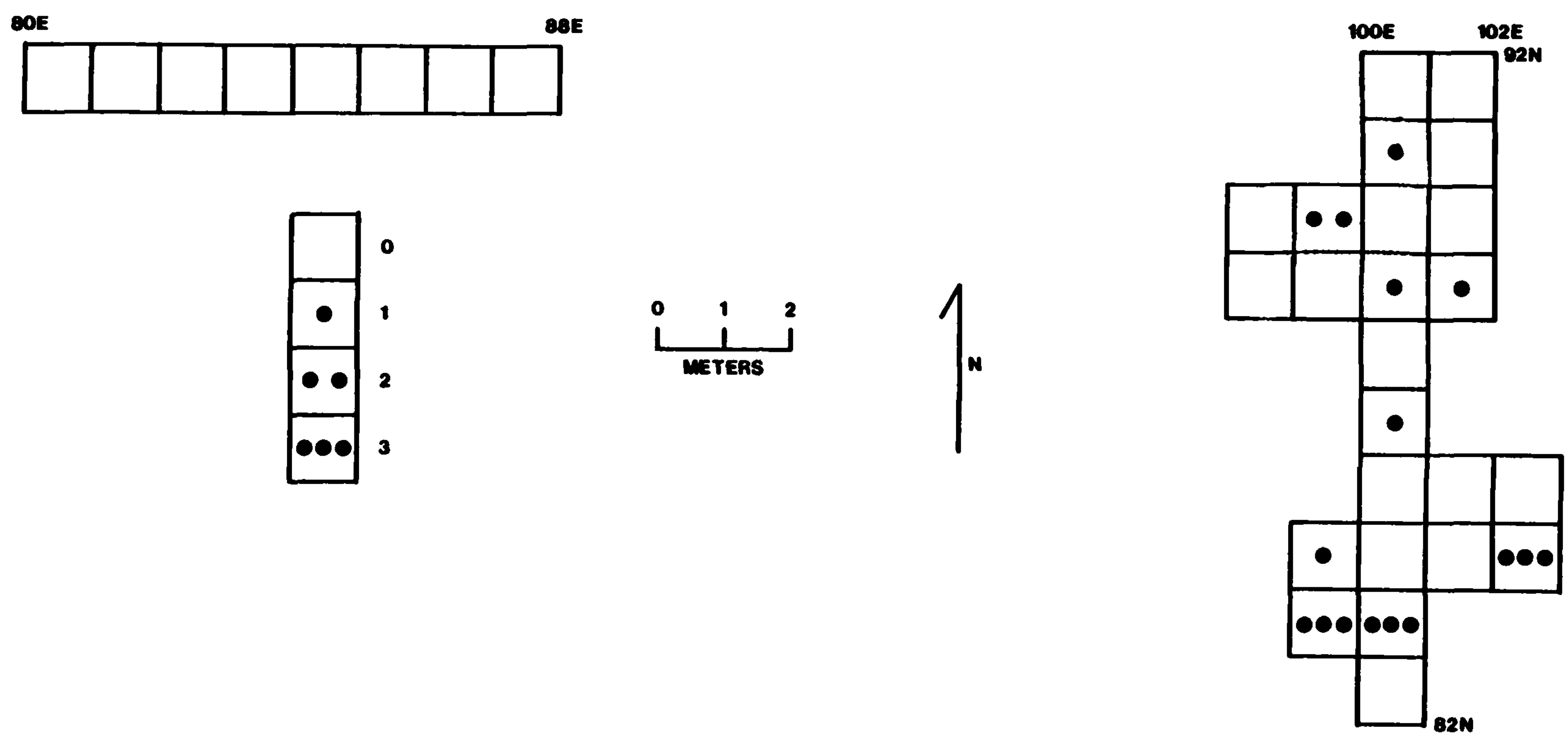


Figure 9.34. Map showing the distribution of porcelain within the test excavations at 14BU1008.

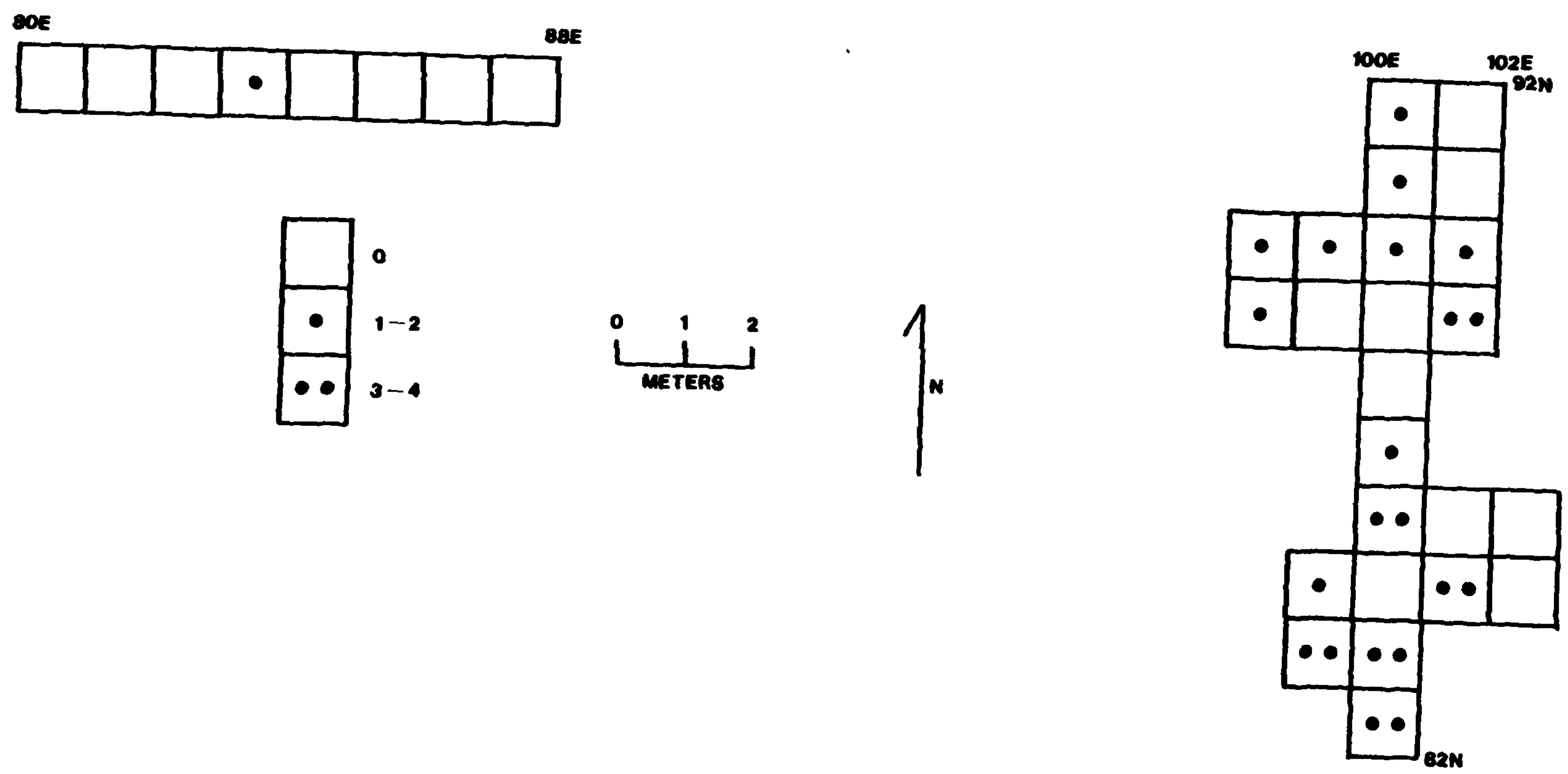


Figure 9.35. Map showing the distribution of 22 caliber cases and bullets within the test excavations at 14BU1008.

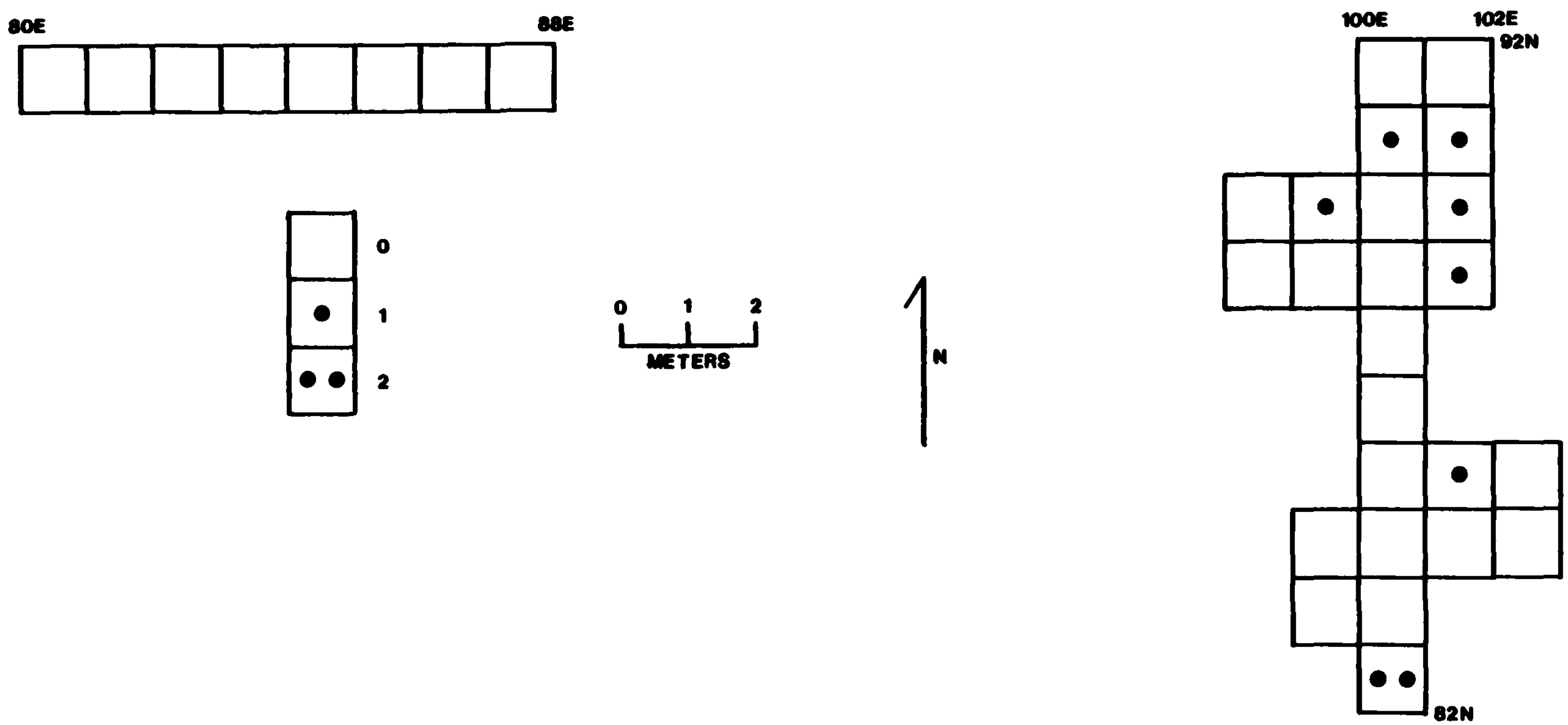


Figure 9.36. Map showing the distribution of 12 gauge shotgun cases within the test excavations at 14BU1008.

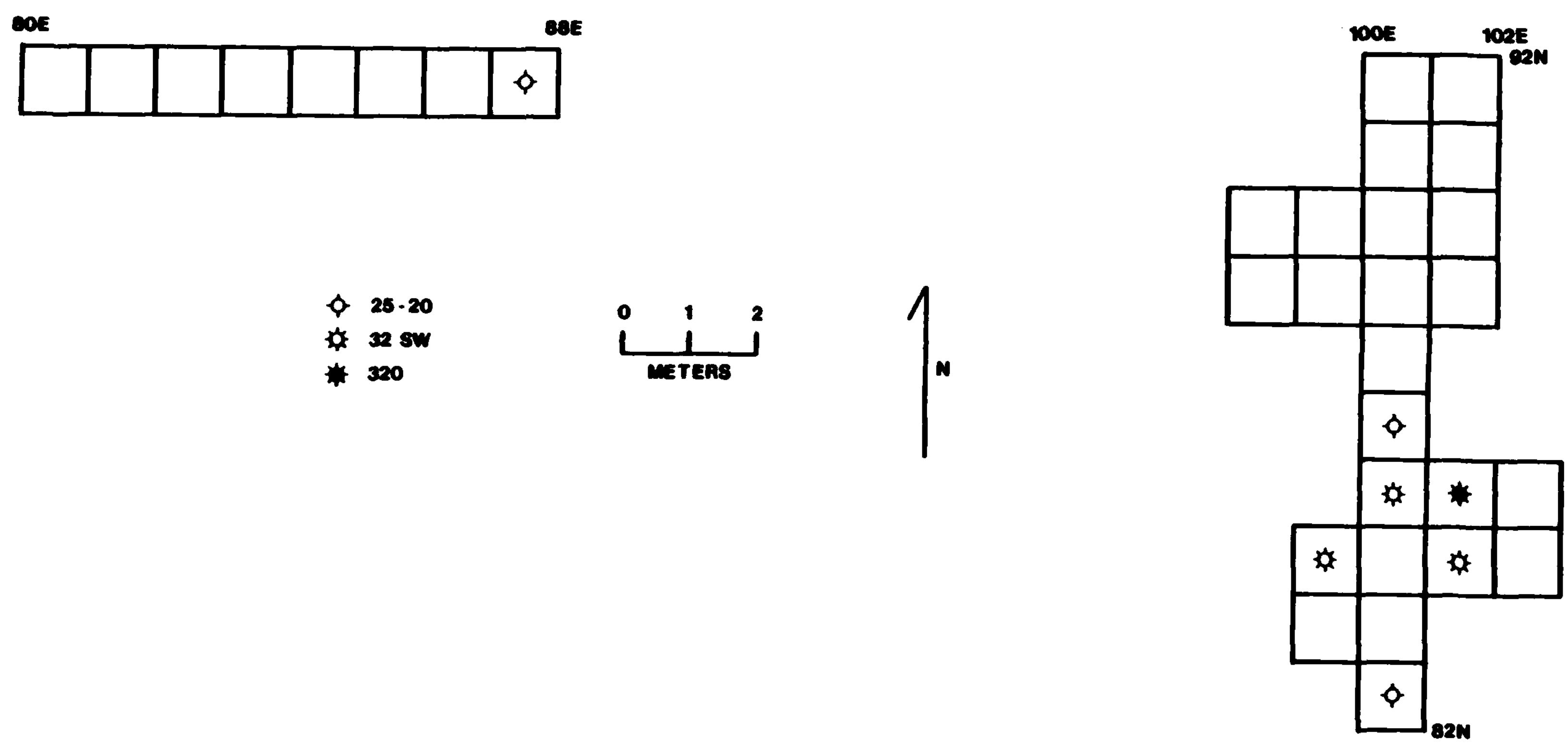


Figure 9.37. Map showing the distribution of centerfire and other firearms cases within the test excavations at 14BU1008.

Artifacts

Surface Collection (n=2)

The Donaldson site was overgrown in grass and weeds, making it impossible to surface collect thoroughly. All surface material was collected from the areas around the test excavations.

One medicine bottle of light manganese and one brass cartridge case were recovered. The cartridge case is a .25-20, center fire, with the U.M.C. headstamp of the Union Metallic Cartridge Company (Logan 1949:189-192.)

Excavated Artifacts

Ceramics

See Anderson, this volume.

Nails (n=340)

This category is further divided into 120 square-cut and 220 wire nails. These two categories are divided according to size.

Square-cut

	1d	2d	3d	4d	6d	7d	8d	9d	10d	16d	20d	indeterminate
quantity	1	2	6	9	10	2	13	4	2	4	2	65

Wire

	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d	12d	16d	20d	indeterminate
quantity	1	6	30	21	13	19	7	41	3	9	5	8	4	53

Staples (n=26)

These specimens are all wire staples probably used in nearby fence construction.

Tacks (n=8)

This category includes one square-cut tack and seven wire tacks.

Roofing Nails (n=2)

These flat headed nails would have been used in attaching roofing to buildings.

Tools (n=6)

Included in this category are: one fragmentary iron, hair curling rod measuring 137 mm. long, 38.6 mm. wide and 10.0 mm. thick (Fig. 46e); one fragmentary end of a box-end wrench with a square opening 7.3 mm. across

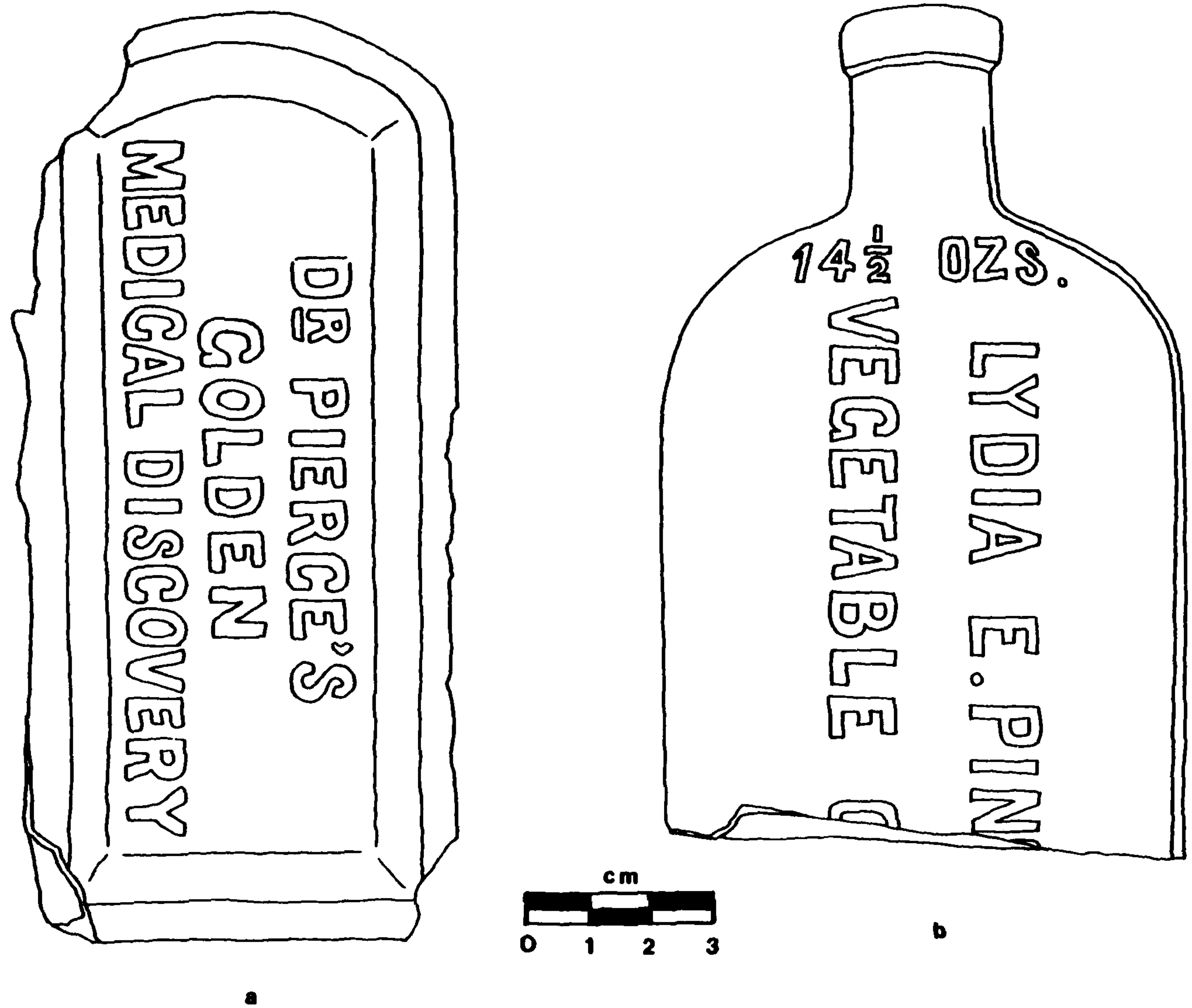


Figure 9.38. Illustrations of two bottles from the test excavations at 14BU1008. a. A90815010101; b. A90815030028.

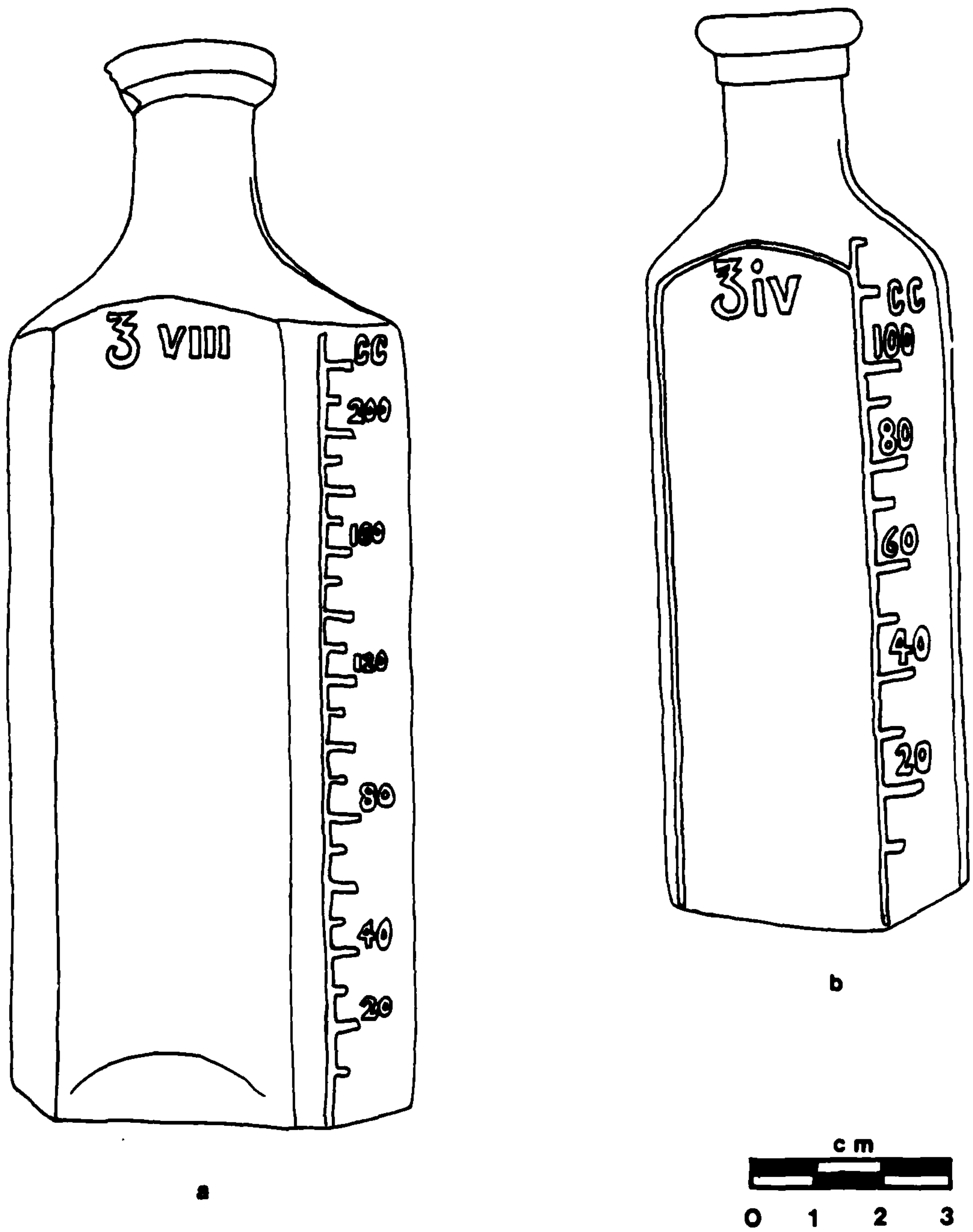


Figure 9.39. Illustrations of two bottles from the test excavations at 14BU1008. a. A90830010001; b. A90830020001.

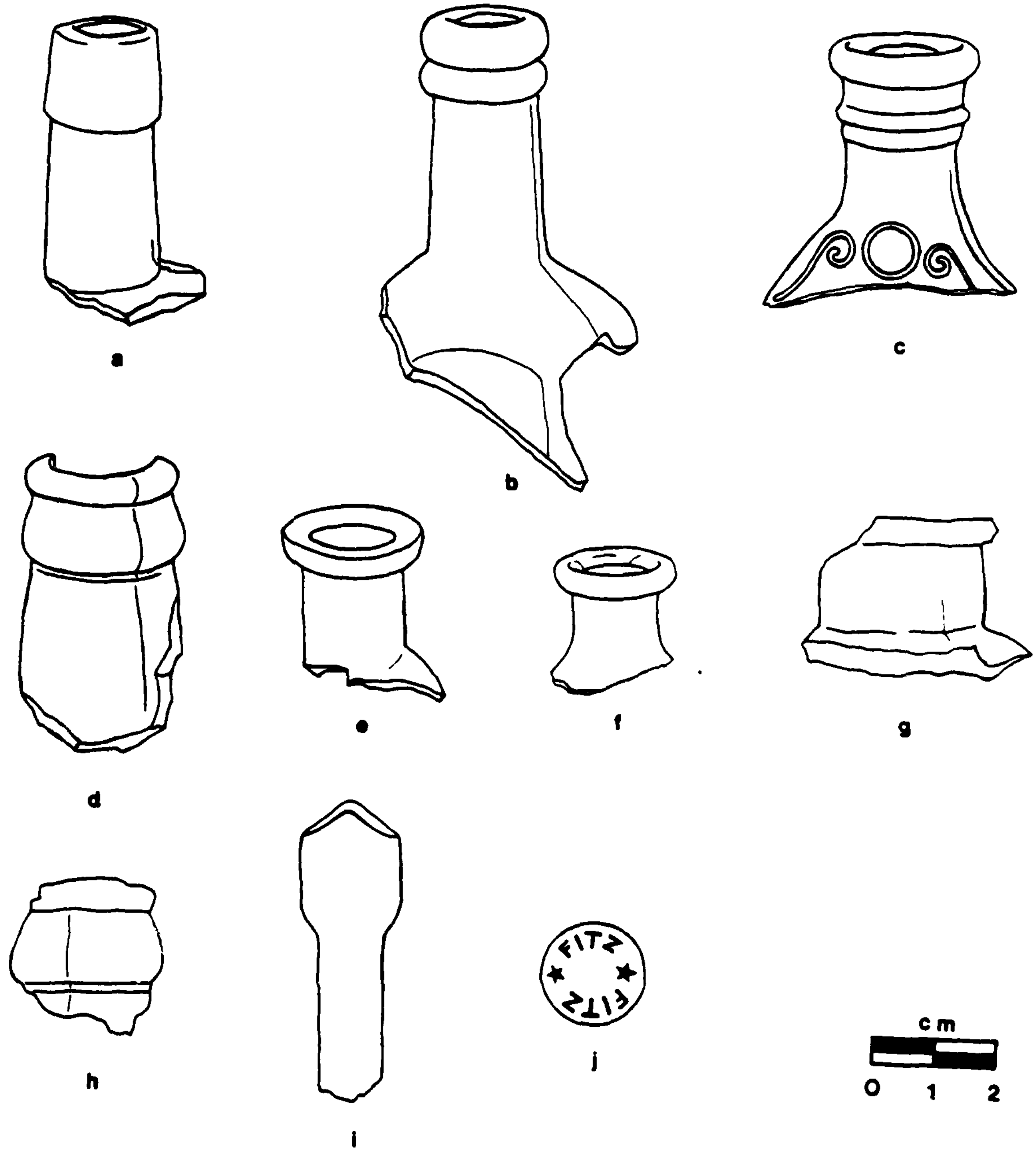


Figure 9.40. Illustrations of bottle rims and a button from 14BU1008.
a. A90815020010; b. A90809010126; c. A90830020003;
d. A90815020013; e. A90809010121; f. A90800000001;
g. A90825010005; h. A90811010004; i. A90808030001;
j. A90810010145.

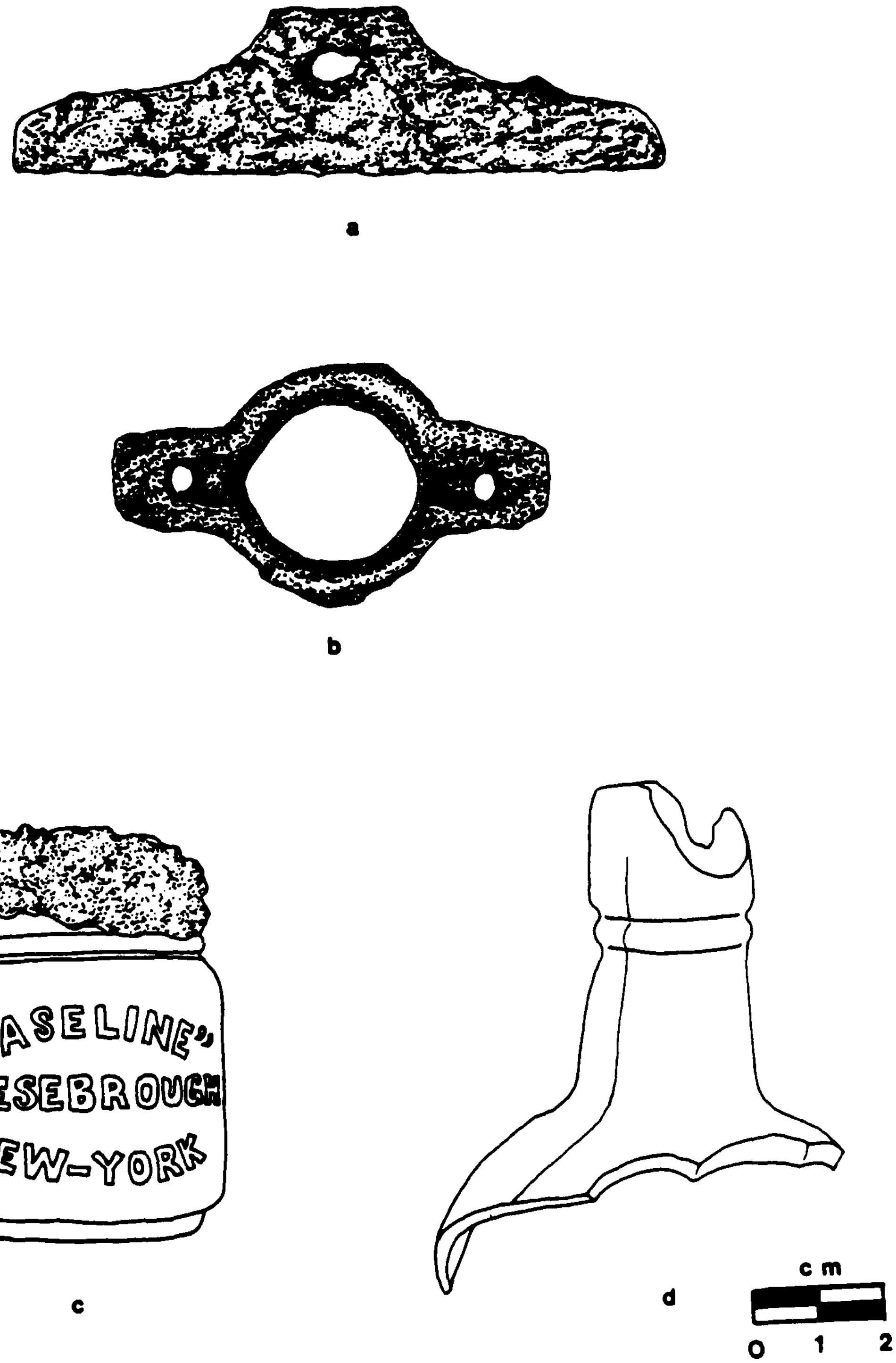


Figure 9.41. Illustrations of artifacts from 14BU1008.

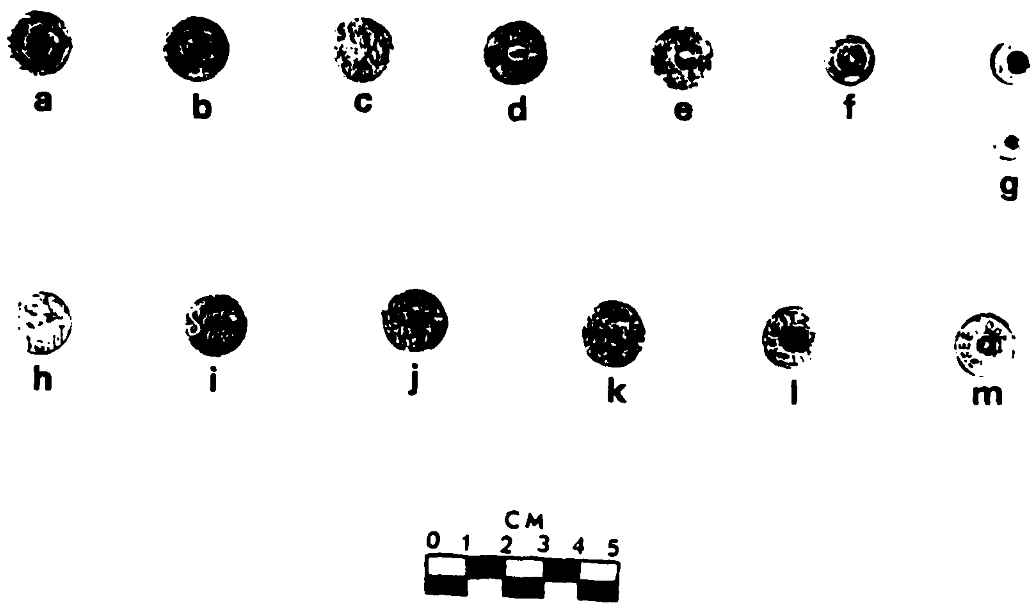


Figure 9.42. Photograph of metal buttons recovered from 14BU1008.
a. button (A90810010156); b. button (A90832020071);
c. button (A90830010066); d. two hole button (A90826010028);
e. one hole button (A90815010104); f. button (A90815020092);
g. snap button (A90815010099); h. "HEAD LIGHT" button
(A90809010185); i. "SWEET ORR" button (A90815010100);
j. "MOGUL" button (A90812020008); k. "GOWDEN" button
(A90825010018); l. "FITZ" button (A90810010145);
m. "SWEET ORR CO." button (A90806010054).

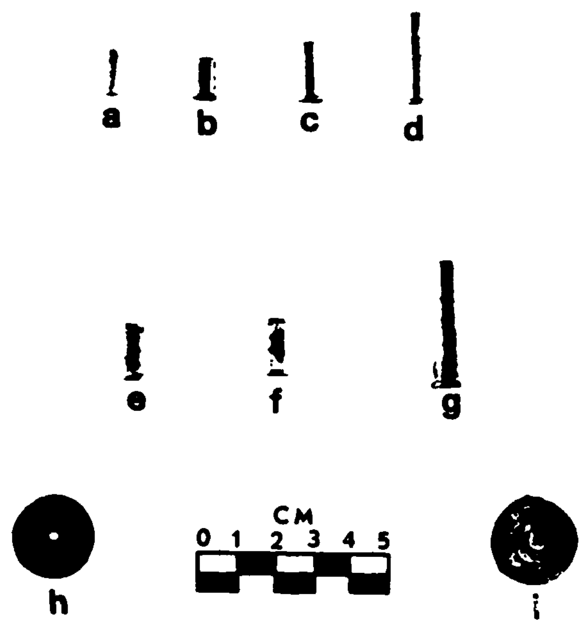
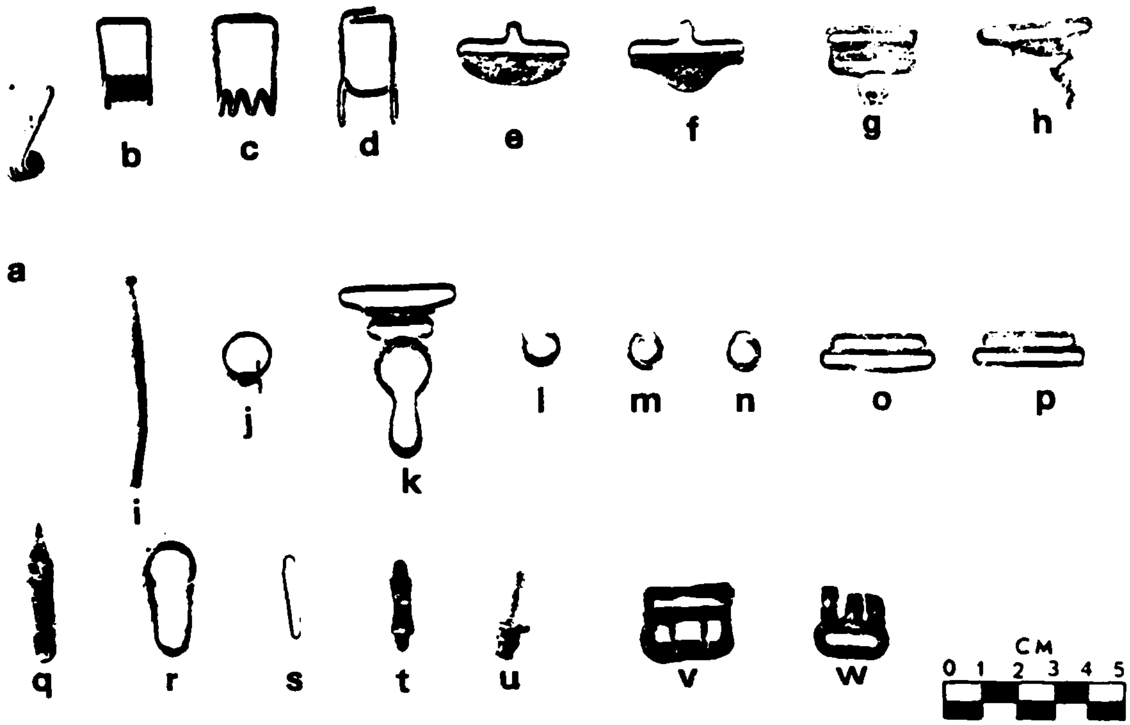


Figure 9.43. Photograph of cartridge cases recovered from 14BU1008. a. unfired 22 cal. short (A90815020087); b. 22 cal. short case (A90828020024): c. 22 cal. long or long rifle case (A908F3020078); d. 22 cal. WRF and Remington Special case (A90809010182); e. 32 cal. Smith and Wesson case (A90830010065); f. 32 cal. Smith and Wesson case (A90807010039); g. 25 .20 case (A90823010008); h. 12 gauge shotgun case (A90802020051); i. 10 gauge shotgun case (A90830020084).



igure 9.44. Photograph of clothes pin springs, clothes fasteners, shoe eyelets, pen head, clips, safety pin, and belt buckles. a. plastic clothes pin (A90811010020); b. clothes pin spring (A90813010046); c. clothes pin spring (A90801010005); d. clothes pin spring (A90832010036); e. clothes fastener (A90810010170); f. clothes fastener (A90809010146); g. clothes fastener (A90828020037); h. clothes fastener (A90805010028); i. brass pin (A90801020034); j. wire ring with clip (A90812010030); k. clothes fastener (A90804010033); l. eyelet (A90803030003); m. eyelet (A90801020042); n. eyelet (A9080102 0044); o. clothes fastener (A90829010120); p. clothes fastener (A9080702004); q. quill pen head (A90830020082); r. paper clip (A90813010049); s. brass safety pin (A90824010033); t. unidentifiable brass artifact (A90830010067); u. unidentifiable brass and iron artifact (A90810010167); v. belt buckle (A90806010057); w. belt buckle (A90801010011).

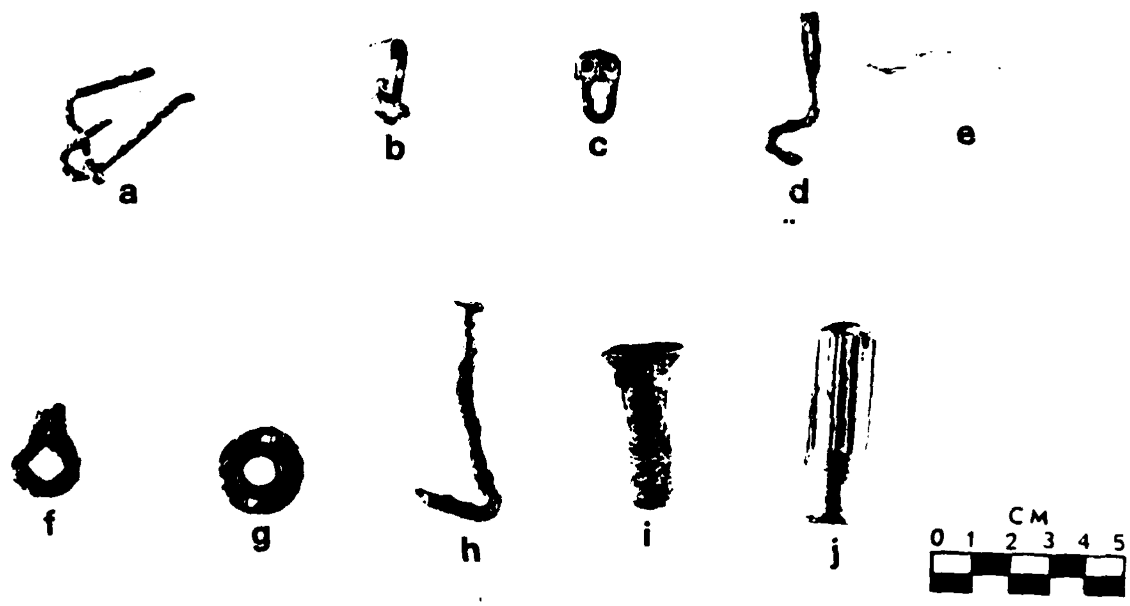


Figure 9.45. Photograph of metal artifacts from 14BU1008. a. unidentifiable iron artifact (A90807010043); b. brass electrical clip (A90810010167); c. brass fastener (A90830020085); d. key (A90814010049); e. spoon (A90832010035); f. end of wrench (A90827010012); g. iron ring (A90826010032); h. bent nail (A90813010057); i. flathead bolt (A90813010053); j. chrome handle (A90811020008).

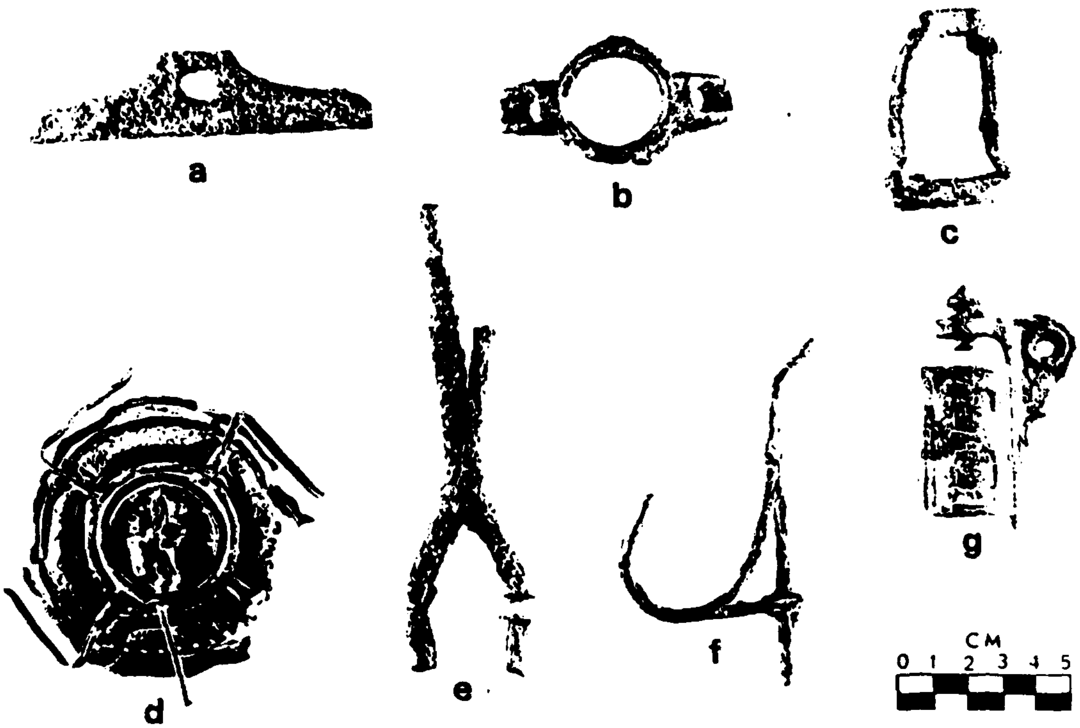


Figure 9.46. Photograph of metal artifacts from 14BU1008. a. unidentifiable artifact (A90813020002); b. unidentifiable artifact (A90801010004); c. harness strap link (A90806020016); d. brass wick holder (A90832020001); e. hair curling iron (A90831020027); f. clothes hook (A90829010114); g. door hinge (A90831010059).

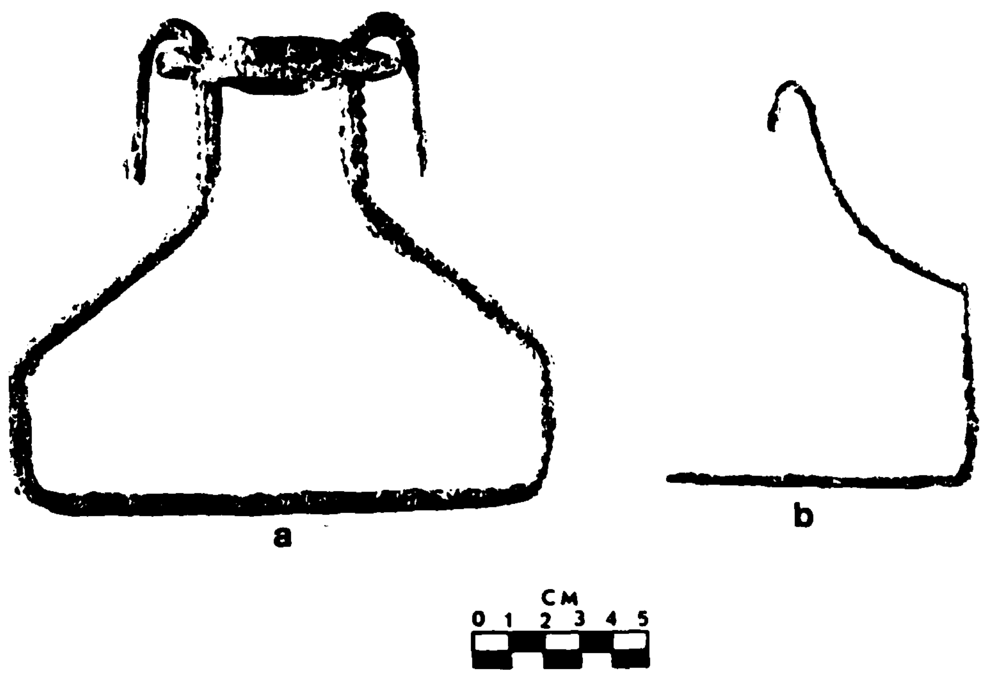


Figure 9.47. Photograph of mop frames from J4BU1008. a. (A90813010056): b. A90809010192).

(Fig. 45f); one fragmentary iron engine crank measuring 415.0 mm. long with a round shaft 19.1 mm. in diameter; one complete, chrome plated iron, screw-on lever handle measuring 52.8 mm. long and 16.7 mm. in diameter (Fig. 45j); one fragmentary, L-shaped, cylindrical wagon handle measuring 142.0 mm. long and 13.3 mm. in diameter; and one iron, flat, square-nosed shovel blade measuring 282.2 mm. long, 237.1 mm. wide and having a socket for a wooden handle.

Stove Parts (n=1)

One fragmentary, cast iron, stove door with the raised letters UKEE / C / WIS is probably from a wood burning stove made in Milwaukee, Wisconsin (Fig. 48).

Firearm Cartridges, Cases and Bullets (n=50)

Included in this category are 35, .22 caliber rim fire cartridges, cases or bullets. Of these, 10 are .22 Winchester Rimfire (WRF) cartridge cases, measuring .960 inch long. This cartridge was introduced for the Winchester Model 1890 pump or slide-action rifle. The .22 WRF was chambered in various Remington, Stevens, and Winchester single shot, repeating rifles and Colt revolvers. It is still loaded by all major ammunition manufacturers, but no one makes rifles for it (Barnes 1965:275). Seven of the cartridge cases have the recessed H headstamp of the Winchester Repeating Arms Co. Two have the U headstamp of the Union Metallic Cartridge Co., and one has the recessed P headstamp of the Peter's Cartridge Co. (Logan 1948:189-192). All have been fired (Fig. 43a, 43b).

Ten .22 caliber cartridge cases are either long or long rifle, measuring .595 inch long. The .22 caliber long was introduced in about 1871 while the long rifle was introduced in 1887. The long rifle was introduced by the J. Stevens Arms and Tool Co. The original case was not crimped, a feature that did not appear until approximately 1900 (Barnes 1965:274). Three cases have the recessed H headstamp of the Winchester Repeating Arms Co. Four cases have the recessed U headstamp of the Union Metallic Cartridge Co. One case has the recessed SUPER X headstamp of the Western Cartridge Co. and one has the cross headstamp (Logan 1948:189-192). All have been fired (Fig. 43c).

Eleven .22 caliber cases are shorts. The .22 caliber short is the oldest American commercial metallic cartridge (Barnes 1965:273). It was introduced in 1857 for the Smith and Wesson First Model Revolver. Three .22 caliber shorts have the recessed H of the Winchester Repeating Arms Co., two have the recessed u headstamp of the Union Metallic Cartridge Co., one has the US headstamp of the United States Cartridge Co., one has the diamond headstamp of the Western Cartridge Co., one has the HP headstamp of the Federal Rimfire Cartridge Co., two have the recessed P headstamp of the Peter's Arms Co., and one has no headstamp (Logan 1948:189-192). All have been fired.

Three .22 caliber lead bullets were recovered. One has been flattened by hitting a solid object. Two still retain their conical shapes. The bullets appear to be from .22 caliber long or long rifles.

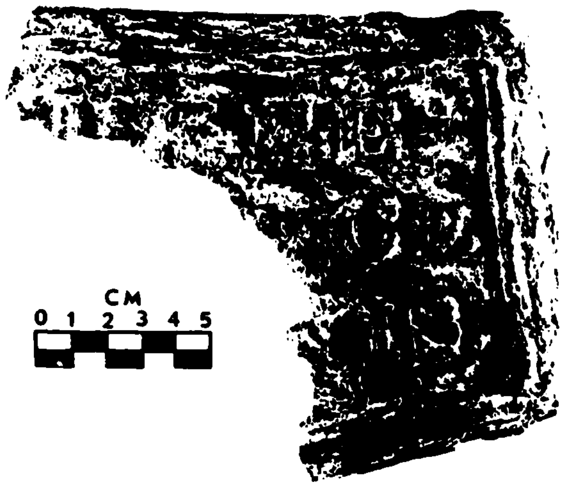


Figure 9.48. Metal stove door (A90806010071).

Four .32 caliber, center fire revolver cartridges were recovered. The .32 caliber cartridge was designed for the Smith and Wesson Model 1½, hinged frame, single action revolver in 1878. Other manufacturers have since manufactured revolvers chambered for the .32 caliber (Barnes 1965:154). Two .32 cases have the impressed U.S. .32 S. & W. headstamp of the Smith and Wesson Arms Co. Two cases lack a headstamp (Logan 1948:189-192). All have been fired (Fig. 43e, 43f).

Three .25-20 WCF center fire cartridge cases were recovered. The .25-20 cartridge was introduced in 1882 for a single shot rifle and was first commercially loaded by Remington (UMC). Winchester Arms Co. designed the .25-20 WCF or repeater version for their Model 92 in 1893 or 1895. This was a shorter cartridge with a bottle-necked case. The .25-20 WCF cartridge is still available (Barnes 1965:74). Of the three .25-20 cases, two have the impressed W.R.A. Co., WCF headstamp of the Winchester Repeating Arms Co. and one has the U.M.C. headstamp of the Union Metallic Cartridge Co. (Logan 1948:189-192). All have been fired (Fig. 43g).

One fragmentary, unfired, center fire cartridge measuring 7.7 mm. in diameter was recovered. It is too fragmentary to determine caliber and make.

One 10 gauge shotgun brass base, with a paper case, was recovered. It has been fired and has the impressed W.R.A. Co., RIVAL headstamp of the Winchester Repeating Arms Co. (Logan 1948:189-192) (Fig. 43i).

Eight 12 gauge shotgun brass bases, with paper cases, were recovered. All have been fired. Three bases have the U.M.C. Co. NEW CLUB headstamp of the Union Metallic Cartridge Co. Two bases have the impressed WESTERN FIELD headstamp of the Western Cartridge Co., one has the impressed WINCHESTER NUBLACK headstamp and another the NEW RIVAL 1901 headstamp of the Winchester Repeating Arms Co. The last base has the impressed POINTER M.F.A. Co. headstamp of the Meriden Firearms Mfg. Co., Meriden, Connecticut (Logan 1948: 189-192) (Fig. 43h).

Wood Screws (n=4)

Included in this category are four, iron, wood screws. Two have flat heads, one has a convex head and the last is indeterminate. The complete screws vary in length from 23.1 mm. to 47.3 mm. and 6.5 mm. to 7.9 mm. in diameter.

Writing Pen Tip (n=1)

Included in this category is one brass, quill pen head, size number 1, with the RESTERBROOK & Co. COLORADO label (Fig. 44q).

Washers (n=5)

Included in this category are five iron bolt washers. They vary in diameter from 16.3 mm. to 38.8 mm. and center holes vary from 4.3 mm. to 12.6 mm.

Buckles (n=3)

Included in this category are three iron buckles, two fragmentary, one complete. The complete buckle measures 18.3 mm. long, 26.2 mm. wide and 3.6 mm. thick (Fig. 44v, 44w).

Bolts and Nuts (n=6)

Included in this category are two round, flat headed bolts which were probably used to attach plow-shares. One measures 42.6 mm. long, 11.4 mm. in diameter and the other 73.6 mm. long and 11.9 mm. in diameter (Fig. 45i). One round, convex headed bolt, measuring 316.1 mm. long and 8.6 mm. in diameter, may also have been used on farm machinery. Two bolts, with round, convex heads, and with notches for straight screw drivers, were recovered. One measures 17.7 mm. long and 6.8 mm. in diameter and the other 19.6 mm. long and 6.8 mm. in diameter. One complete, chrome plated iron, hexagonal nut with a 4.3 mm. diameter hole was also recovered.

Horse Shoes (n=2)

Two complete horse shoes are included in this category. One shoe has six nails still attached to it.

Mop Frames (n=2)

Two iron-wire mop head frames are included in this category. One is complete, measuring 160.0 mm. wide (Fig. 47).

Clothes Pins (n=9)

Eight clothes pin springs, of which four are of ungalvanized steel and four of galvanized steel, were recovered (Fig. 44b, 44c, 44d). One partially complete clothes pin, made of translucent yellow plastic and a galvanized spring, was also recovered (Fig. 44a).

Wire

This category is divided into plain wire (99.2 grams) and barbed wire (41.6 grams). All pieces are small fragments which are poorly preserved. The barbed wire would have been used in fence construction.

Iron Metal

Included in this category are all small, unidentifiable fragments (578.7 grams) of iron which are poorly preserved (Fig. 45a).

Buttons (n=21)

Included in this category are five, one-piece iron, flat-top, round buttons with back attachments. They vary in diameter from 15.2 mm. to 17.8 mm., with no identification marks (Fig. 42a, 42c).

Four buttons are one-piece iron with flat tops and two center holes for attachment. They vary from 17.2 mm. to 19.4 mm. in diameter (Fig. 42d). Identification marks are absent.

One fragmentary, one-piece, flat top, iron button has a single center hole for attachment. It measures 14.3 mm. in diameter (Fig. 42e).

Twelve buttons are two-piece consisting of brass-clad iron. Three of these have flat tops, attach from the back and have no identification marks. They have diameters varying between 13.9 mm. to 17.5 mm. (Fig. 42b, 42f).

One fragmentary, flat top, two-piece button has the raised letters "COWDEN" on a stipled background. It measures 17.8 mm. in diameter (Fig. 42k). Two flat top, two-piece buttons have the raised letters "HEAD LIGHT" and measure 17.0 mm. in diameter (Fig. 42h). Two flat top buttons, measuring 16.8 mm. and 17.5 mm. in diameter, have the raised letters "SWEET-ORR & Co." (Fig. 42i; 42m).

One fragmentary, two-piece, flat top button has the raised label "MOGUL" on a stipled background and measures 17.0 mm. in diameter (Fig. 42j). Another two-piece button has a slightly convex top and the raised label "FITZ" (Fig. 42l, 40j).

One, two-piece button, measuring 16.0 mm. in diameter, has a 6.6 mm. square center hole for attachment. It lacks an identification label. Also recovered was one, two-piece, brass snap-type button measuring 12.4 mm. in diameter. It also lacks an identification label (Fig. 42g).

Garter and Suspender Strap Fasteners (n=12)

Included in this category are five fragmentary iron fasteners (Fig. 44h), five complete copper fasteners and two incomplete copper fasteners. They vary in width from 26.1 mm. to 32.7 mm. (Fig. 44e, 44f, 44g, 44k, 44o, 44p).

Safety Pins (n=4)

Included in this category are two fragmentary brass pins and one chrome plated steel end of a pin. One complete, old style, brass pin was also recovered (Fig. 44s).

Eyelets (n=3)

Three brass eyelets, probably from shoes, have orifices of 6.2 mm. and outside diameters of 11.6 mm. (Fig. 44l, 44m, 44n).

Bottle and Can Lids (n=8)

Four crown cap type bottle caps measuring 30.0 mm. to 30.8 mm. in diameter were recovered. These were probably used on soft drink bottles. Two round, press-in can lids measuring 47.5 mm. and 50.0 mm. in diameter were probably used for storage of household goods. Two fragmentary

screw-on iron bottle caps, measuring 31.9 mm. in diameter, were probably used for medicine or storage bottles.

Spoons (n=1)

Included in this category is the distal end of a baby spoon. The spoon is made of aluminum (Fig. 45e).

Miscellaneous Metal Artifacts (n=42)

Included in this category are: one unidentifiable iron pin which has one round end with a small eyelet and measures 59.5 mm. long and 3.3 mm. in diameter (Fig. 44i); one fragmentary, iron hair pin with a black, glass ball head; one fragmentary, unidentifiable, circular iron artifact with a hole 7.1 mm. in diameter and an outside diameter of 23.0 mm. (Fig. 45g); one complete, unidentifiable, iron ring with a press-clip for attachment to a shirt pocket (Fig. 44j); one large, fragmentary, cylindrical, L-shaped, iron bar, weighing 3,422 grams and having a diameter of 36.2 mm.; one complete, unidentifiable, iron artifact which measures 68.0 mm. long, 37.0 mm. wide and 11.4 mm. thick and has a 25.2 mm. diameter hole in the center and a single thread inside the large center hole for attachment (Fig. 41b, Fig. 46b); one unidentifiable, iron plate, measuring 101.0 mm. long, 25.2 mm. wide and 4.6 mm. thick and having a beveled edge with a center hole 10.3 mm. in diameter (Fig. 41a, Fig. 46a); one size 12d wire nail which has been bent into an L-shape to form a hook and was probably used as a latch on a door (Fig. 45h); one fragmentary, iron, can opening key for cans with tab-tops (Fig. 45d); one complete, iron harness strap link which measures 58.1 mm. long, 38.9 mm. wide and 10.00 mm. thick (Fig. 46c); one fragmentary, iron rivet measuring 39.6 mm. long and 6.5 mm. in diameter; one complete, iron disc, measuring 19.2 mm. in diameter and 0.8 mm. thick with a press clip for attachment to clothing; one fragmentary steel spring; three iron paper clips (Fig. 44r); one iron, round base or bottom to a container which measures 70.1 mm. in diameter; one iron, round, one-gallon size container with a wire-loop handle; one used hog ring; one fragmentary, iron door hinge with a raised "S" on the cover to the door pin (Fig. 46g); one complete wire clothes hanger hook which screws into the wall (Fig. 46f); one complete iron cotter-key measuring 30.0 mm. long; one small fragment of aluminum foil; two globular pieces of lead, one weighing 5.1 grams and the other 2.6 grams; six fragments of zinc sheet metal and one zinc top to an Avon cosmetic tube with a screw-on cap; one complete, brass, squeeze type electrical connector clip (Fig. 45b); one fragmentary, brass, wick holder for a kerosene lamp (Fig. 46d); five unidentifiable brass artifacts (Fig. 45a) of which one is a flat plate measuring 26.0 mm. long, 6.6 mm. wide and 0.6 mm. thick with a center hole 1.0 mm. in diameter (Fig. 44t); one piece of coiled brass (Fig. 44u); and one U-shaped clip; a brass fastener, measuring 19.1 mm. long, 12.6 mm. wide and 1.0 mm. thick, with a slide-notch hole at one end for a bolt or screw, and two rivets at the other end (Fig. 45c).

Sulphur (n=2)

Two pieces of sulphur weighing 1.9 grams were recovered from near Feature 1, a hearth.

Tar (n=2)

Included in this category are two globular pieces of black tar, one weighing 7.1 and the other 12.3 grams.

Coal and Coal Slag

Several small pieces (1.1 grams) of coal and slag were recovered from the excavation.

Shell

Numerous fragments of shell (33.4 grams) were recovered from throughout the excavation.

Burned Earth

Several small fragments (5.9 grams) of burned earth were recovered.

Cement

Several fragments of cement mortar (183.0 grams) were recovered.

Charcoal

Several small fragments of charcoal (10.9 grams) were recovered.

Graphite (n=3)

Included in this category are fragmentary, cylindrical, graphite bars. They vary in diameter from 5.1 mm. to 7.7 mm. They are probably from the interior core of dry cell batteries.

Stained Ivory (n=1)

One incomplete piece of brown, stained ivory, with a 4.3 mm. diameter hole bored into the narrow end and discernible saw marks on the wide end, has a lateral snap at the small end. It measures 49.3 mm. long, 17.3 mm. wide and 10.2 mm. thick (Fig. 40i).

Plastic Tools (n=3)

Included in this category are: one black plastic screw-on bottle cap measuring 20.0 mm. in diameter; one fragmentary, green plastic, eating fork; and one green plastic comb tooth measuring 28.1 mm. long.

Plastic

Two types of plastic are included in this category: rigid (11.5 grams) and pliable (1.3 grams). The rigid plastic is probably from toys and household items while the pliable are fragments of black sheet plastic.

Tire Rubber (n=11)

Included in this category are eleven pieces of tire tread. Eight of these fragments show evidence of having been from retreaded tires.

Floor Covering (n=18)

This category includes pieces of blue floor tile, probably from the recently vandalized stone house.

Unworked Stone (5,895.9 grams)

Included in this category are several types of stone: limestone, chert, pumice, and slate. The slate is probably from writing tablets while the chert and limestone are from construction activities. The pumice may have been used in household activities. Most of the unworked stone (5,639.2 grams of limestone) was recovered from Feature 3, the post stain.

Faunal Remains

Several large bones with saw marks, but not identifiable as to species, are probably of cattle and pigs. Included in the bones which were identifiable are: the distal epiphysis of a right tibiotarsus of an immature turkey (*Meleagris sp.*); a distal and fragment of a right humerous of a raccoon (*Procyon lotor*); one complete, left mandible, with an intact M_1, of a muskrat (*Ondatra zibethicus*); one complete right femur of a dog (*Canis familiaris*); a proximal end of a urostyle-axial of a toad (*Bufo sp.*); a distal end of a left humerus and a proximal end of a left carpometacarpus of a mallard duck (*Anas platyrhychos*).

Domestic chicken (*Gallas gallas*) is the best represented animal in the faunal assemblage. The following elements were recovered: one proximal end of a left tibiotarsus; one distal end of a left tibiotarsus; one left acetabulum; one right acetabulum and ilium; one disto-lateral left femur shaft; one proximal end of a left femur; one complete right carpometacarpus; one incomplete left humerus; one fused vertebrae and axial; one proximal end of a left fibula; one proximal end of a left radius; one proximal end of an immature left scapula; and one complete left tarsometatarsus.

Window Glass (n=362)

This category is further divided into four color types: clear (110); aqua (25); green tint (226); and light manganese (1).

Bottle Glass (n=914)

This category is further divided into 12 color types: clear (389); amber (52); green tint (68); dark manganese (15); light manganese (141); aqua (162); milk (65); frosted clear (8); translucent milk (4); sea green (4); cobalt blue (3); and yellow tint (3). Several bottle fragments have characteristic features and are described separately below according to color.

Clear

One crenated base or rim fragment with a diameter of 70.0 mm.
One straight rim (type 10) fragment of a drinking glass.
One complete rim of a bottle with a blob top (type 1) and having an orifice of 11.1 mm. The seam extends to the base of the rim making the time of manufacture of the bottle between 1880 and 1900 (Adams 1971) (Fig. 40c).
One fragmentary medicine bottle with a graduated scale in cc. (Fig. 39a).
One fragmentary rim with a screw top and an orifice of 11.9 mm.
One rim fragment with a packer top (type 3) and an orifice of 10.2 mm.
One fragment with the raised letter "B".
One rim fragment of a screw top mason jar with an orifice of 60.0 mm.
One rim fragment has a packer-like top (type 3) and has an orifice of 18.0 mm. The seam extends to the middle of the lip, making manufacture of the bottle between 1860 and 1880 (Adams 1971) (Fig. 41d).
One bottle with an extract top (type 7) has an orifice of 17.0 mm. The bottle has the letters LYDIA E. PIN / VEGETABLE O (Fig. 38b). It has an applied lip and the seam extends half way up the neck, making manufacture of the bottle between 1860 and 1880 (Adams 1971). It is a 14½ ounce size bottle.
One rim fragment with an extract top (type 7) with an orifice of 15.0 mm.
Two round, base fragments, one measuring 80.0 mm. and the other 70.0 mm. in diameter.
One base fragment of a rectangular bottle measuring 32.6 mm. wide. It has a rectangular, shallow kickup.
One glass fragment with the raised letters "MELTO".
One straight rim fragment, probably of a chimney for an oil burning lamp. It measures 60.0 mm. in diameter.
One crenated base fragment of a bowl. It measures 80.0 mm. in diameter.
One rim fragment of a jar with a screw top. The orifice is 70.0 mm.
One straight rim fragment with a small blob lip (type 11) with an orifice of 70.0 mm. (Fig. 40f).
One rim fragment of pressed glass (sunburst design) with a blob lip (type 2) and an orifice of 260.0 mm.
One rim fragment of a bowl or drinking glass with a round lip (type 13).
Two round base fragments, one measures 65.0 mm. and the other 55.0 mm. in diameter. Kickups are absent on both bases.
One, round, crenated rim fragment.
Two, straight, rim fragments (type 10) to bowls or drinking glasses.
One rim fragment to a threaded mason jar with an orifice of 55.0 mm.
One glass fragment with the raised letters "E. WIS.".
One rim fragment of pressed glass.
One round, base fragment with a slight kickup.
One medicine bottle fragment with graduations in ounces on the left and cc. on the right. Identification marks are absent (Fig. 39b).

One pouring spout with rolled edges. It measures 17.1 mm. long and 15.6 mm. wide.

One rim fragment with an outflaring lip (type 5) and an orifice of 10.0 mm.

One medicine bottle fragment with a graduated scale on the right side.

Green Tint

Two rim fragments of a bowl with a straight rim (type 10) and an orifice of 100.0 mm.

One rim fragment with a type 14 rim. The seam extends the full length of the neck making the manufacture of the bottle after 1903 (Adams 1971) (Fig. 40d). The orifice is 15.7 mm. This is probably a soft drink bottle.

One nearly complete, rectangular medicine bottle, with the raised letters "DR. PIERCE'S GOLDEN MEDICAL DISCOVERY" on the front and "R.V. PIERCE, M.D." on the side (Fig. 38a). The bottle measures 8 3/4 x 1 5/8 x 3 inches. An 1872 advertisement in the Ithaca Journal (N.Y.) states two to six bottles were warranted to cure salt rheum or tetter, etc. Six to twelve bottles for scrofulous swelling and sores, pains in bones, etc. It was manufactured in Buffalo, New York by R.V. PIERCE, M.D., World's Dispensary (Baldwin 1973:387-88). This bottle probably dates between 1870 and 1900.

One complete rim of a rectangular bottle has an orifice of 9.0 mm. and a blob top (type 1). The seam extends to the base of the rim making manufacture of the bottle between 1880 and 1900 (Adams 1971) (Fig. 40b).

Dark Manganese

One, straight rim of a glass or bowl (type 10 rim).

Amber

One fragmentary bottle with the raised letters B EGG S / -DEL-. This is a patent medicine bottle manufactured and sold by Begg's and dates between 1885 and 1900 (Baldwin 1973:61).

Cobalt Blue

One base fragment of a round jar or bottle measuring 50.0 mm. in diameter.

Light Manganese

One crenated lip fragment with an indeterminate orifice diameter.

One complete rim with an orifice of 8.7 mm. and a type 5 rim. The seam extends to the base of the neck making the manufacture of the bottle probably between 1860 to 1880 (Adams 1971) (Fig. 40e).

One complete rim with an applied, type 6 rim, and an orifice of 12.2 mm. The seam extends to the base of the rim making manufacture of the bottle between 1880 and 1900 (Adams 1971).

Ten fragments of pressed glass.

One rim fragment with an outflaring lip (type 13) and an orifice of 60.0 mm.

One rim fragment of pressed glass with an outflaring rim, flat lip (type 14), and an orifice of 180.0 mm.

One fragmentary, crenated rim and lip of a bowl with an orifice of 160.0 mm.

One pressed glass fragment of a bowl with a blob lip and an orifice of approximately 260.0 mm.

One fragmentary base of a square or rectangular bottle with rounded corners and lacking a kickup.

Two straight rim fragments (type 10) of a bowl with an orifice of approximately 100.0 mm.

Five straight rim fragments of pressed glass (type 12 rim).

One rim fragment with an extract top (type 7) and an orifice of 15.0 mm.

One crenated base fragment, probably to an oil burning lamp. It has a kickup and measures 130.0 mm. in diameter.

One complete, round bottle with a metal, screw cap, has the letters
VASELINE
CHESEBROUGH . The seam extends to the top of the lip, making
NEW - YORK
manufacture of the bottle after 1903 (Adams 1971) (Fig. 41c). The bottle measures 47.0 mm. in diameter and 68.0 mm. high.

Aqua

One fragment of a rectangular medicine bottle with the raised letters AWLEIGH'S
I-PAIN O .

One rim fragment of a threaded mason jar.

One rim fragment with an extract top (type 7) and an orifice of 15.0 mm.

One crenated rim fragment with an indeterminate orifice diameter.

One fragmentary medicine bottle with the raised letters "R_x Co.".

One fragment with the raised letters "RSA".

One rim fragment (type 8) with a seam extending to the top of the rim, making manufacture of the bottle after 1903 (Adams 1971). This is probably a soft drink bottle. The orifice is 15.0 mm. (Fig. 40h).

One complete rim with a packer top (type 3). The orifice is 9.2 mm. The seam extends to the middle of the neck making manufacture of the bottle between 1860 to 1880 (Adams 1971) (Fig. 40a).

One rim fragment (type 5 rim) with an orifice of 20.2 mm. The seam extends to the middle of the neck making the manufacture of the bottle probably between 1860 to 1880 (Adams 1971) (Fig. 40g).

AD-A124 947 ARCHAEOLOGICAL INVESTIGATION AT EL DORADO LAKE BUTLER COUNTY KANSAS PHASE III(U) KANSAS UNIV LAWRENCE MUSEUM OF ANTHROPOLOGY A E JOHNSON ET AL. 1982 1/1

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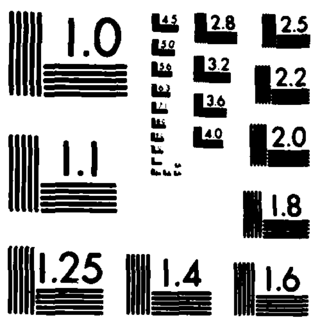

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Summary

The large quantity and variety of cultural remains recovered from the Donaldson stone house site allows the following inferences to be made:

(1) On the basis of seam molds and maker's marks on bottles recovered from the refuse area, the Donaldson stone house was built in the 1860's or 1870's and was continually occupied through the first half of the 20th century. This confirms the documentary record.

(2) The large quantity of medicine bottles which date between 1880 and 1900 indicates a resident of the house was ill at this time. Since Mrs. Donaldson resided at the house until her death in August, 1883, these may have been used by her in her ailing health. On the other hand, a member of the Holderman family, owners of the house from 1886 to 1905, or one of their tenants may also have had someone ill in the family.

(3) The large quantity and variety of cartridge cases indicate that target practice or hunting was an important activity at the stone house. At least six different firearms were discharged around the house: .22 WRF, .22, .32 revolver, .25-20 rifle, 12 and 10 gauge shotguns.

(4) A wooden structure supported by shallowly buried posts once stood approximately 15 meters east of the house.

(5) The backyard, or side yard, was used for cooking activities. The hearth, Feature 1, possibly dates to the 1880's on the basis of the fragment of a Begg's patent medicine bottle which was found in association with the hearth.

(6) On the basis of datable bottles, most of the refuse was deposited from the 1870's to 1900. This correlates well with the high frequency of square cut nails.

(7) The locations of datable items, mostly bottles and square cut nails, suggest the earliest refuse was dumped in the south part of the excavation area while the more recent cultural remains were disposed of throughout the entire area of the excavation.

(8) The frequency of higher social status items, such as porcelain wares and tools made of brass and copper, indicates the residents of the Donaldson stone hosue were of higher social and economic status compared to the residents of the Osborn log cabin.

(9) Greater social and economic status is also seen with the increase in non-local products, particularly medicines and articles of clothing manufactured in many parts of the eastern United States.

Summary and Conclusions

The data acquired during the test excavations in conjunction with the documentary record contribute to three interrelated areas of research interest: settlement patterns, material culture changes, and economic networks (Roberts 1981).

Settlement Patterns

Roberts (1981) developed the following pattern of American settlment in the El Dorado Lake area. The first settlers built upon the floodplain of the Walnut River and its tributaries. This forested ecotone was similar to the eastern woodlands from which the settlers came. These early agriculturalists farmed the fertile bottom land.

Because of the periodic flooding of the Walnut River and its tributaries, the settlers began in the late 1860's moving their dwellings to higher ground. New settlements in the 1870's and later also occur in the uplands in order to avoid periodic flooding. The Osborn log cabin site (14BU1004) and the Donaldson stone house (14BU1008) are two examples of dwelling construction on the second bottoms.

During the 1880's a second period of settlement relocation occurred. The inhabitants who had originally built on the floodplain and moved to the second bottoms in the 1860's found that these were also prone to periodic flooding. People then moved again to higher ground. By the end of the 1880's most of the areas occupation sites were in the uplands (Roberts 1981).

Material Culture Changes

Roberts (1981) has defined some of the more important material culture changes in the El Dorado Lake area. The most important is in dwellings, with simple log cabins having been built by the first settlers followed by stone house construction between 1869-1883. Stone houses were apparently of high status. The later settlers during the expansion period built two or more storied frame houses which were popular through the early 20th century.

The high frequency of earthenware and stoneware crockery sherds in the El Dorado area is related to the raising of cattle and the settlement of the uplands. As the uplands became more economically important, dairy products such as cheese became more dominant. The large crocks, as represented in the sherd collections, were used in cheese production (Roberts 1981).

Social status and temporal change in artifacts is visible within the archeological record at the Osborn log cabin (14BU1004) and the Donaldson stone house (14BU1008). Examination of the porcelain artifacts, porcelain being a status item, shows eight porcelain buttons and two porcelain pottery

fragments were recovered from the Osborn log cabin site. In contrast, one porcelain button and 15 porcelain pottery fragments were recovered from the Donaldson stone house site. The greater social status of the residents of the Donaldson stone house is reflected in the greater frequency of porcelain artifacts and artifacts made of brass and copper. Few artifacts made of brass or copper were recovered from the Osborn log cabin site. Since the excavations at the Donaldson stone house were within a refuse disposal area, the temporal placement of these artifacts is difficult to assess except for a few bottles which have discernible marks.

Economic Networks

The lack of artifacts identifiable as to time and place of manufacture, except for some bottles and ceramics, makes it difficult to reconstruct early historic trade networks which operated within the El Dorado area. The only artifacts which have been identified as local products are some hand-forged iron tools. Other artifacts appear to have originated in the states of Indiana and Illinois. Some products were manufactured farther east in New York. Some of the bottles of patent medicines recovered from the Donaldson stone house indicate the use of some of these popular medicines manufactured in New York. The settlers maintained economic ties to eastern manufacturers. Larger collections with more identifiable specimens will make it possible to better define the economic networks operative during American settlement of the area (Roberts 1981).

Conclusions

The survey and testing of historic sites has produced a great deal of information. Clarification of location indicates the original Chelsea town site on Chelsea Hill will not be destroyed by the El Dorado Lake project. The material culture recovered from several early settler sites has provided new information regarding pioneer adaptations in the area. The sequence of early settlement of the floodplain, second bottoms, and finally the uplands (Roberts 1981) shows an adaptive sequence for the local settlement system.

The preservation and acquisition of knowledge about Butler County's history prior to the loss of the physical manifestations is the primary goal of this project (Roberts 1981). Additional excavations of other site types of the historic period in the area which will be destroyed by construction of El Dorado Lake will provide the necessary data to expand upon the documentary record and to develop a more complete representation of the past lifeways and cultural adaptations of our immediate ancestors in the tall grass Plains.

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CHAPTER 10

PRELIMINARY EXCAVATIONS AT THE NEW CHELSEA SITE, 14BU1007:

THE BLACKSMITH SHOP

Ricky L. Roberts

Introduction

During the latter half of the 19th Century when the Great Plains of North America were being settled by Euro-American pioneers, thousands of towns were established. Many were successful, but many more were not. In Kansas alone, more than 2800 of the towns established during this period did not survive. Chelsea, Kansas was one of these casualties of 19th Century economics and expansionism.

Anthropologically, the western town is a central place in the mythology of the American west. It is a backdrop of hitching posts along dusty streets and saloons with swinging doors before which the great American morality play is performed. For the average American, and for many people all over the world, the simple utterance of names such as Wichita, Dodge City, or Abilene ushers in a romantic picture reinforced by years of dime novels, comic books, movies, and television shows. The notion of the forces of good meeting the forces of evil in a stentorian shootout, wherein the men in white hats triumph over those in black before the townfolks in their unpretentious houses and shops, is a bit of Americana that pervades the world. Yet, reality involved more mundane matters than meting out justice to malefic marauders. Most western towns never experienced a shoot-out, only a few were even occasionally visited by true cowboys, and many appeared and disappeared quietly with names that survive as ozymandian testaments on long-forgotten plats or as vague memories to descendents of the townspeople.

Western towns provided a much more valuable and necessary service than the fictional forum for violence with which they have been bridled by mythology. A town was the economic and social nexus for the nuclear family outliers who effected the settlement of the west. In their layouts and names, many of the towns reflect a conscious effort by the settlers to transport a recognizable form of "civilization" with them to the frontier.

Chelsea, Kansas was just such an unobtrusive urban junction for the farmers settling Butler County in the 19th Century. As Butler County's first residents moved out of the "second American frontier" in 1857 and into this border area of the Flint Hills they realized the need for a town. One of the first actions they took upon arrival was to establish a county seat they called Chelsea (after a Boston borough) and have it legally chartered. Chelsea lost its political importance to El Dorado in 1864 and quickly declined thereafter. However, the concept of the town was sufficiently strong to undergo successfully a translocation and subsequently a new physical manifestation (cf. Wilk 1981 and Thomas, this volume). The relocated Chelsea, hereafter also called the New Chelsea site, 14BU1007, was economically and demographically more successful than its predecessor but eventually met the same fate. And yet, the notion of a Chelsea community, in part supported by the existence of a Chelsea

township, exists among the area's present (or immediately past) inhabitants.

Towns were a significant component in the settlement of the West that have received too little attention in the historical archaeological literature of the American frontier. Chelsea provides the opportunity to wed documentary data with archaeological investigation and derive an anthropological/historical perspective on the role of a town in the settling of the Great Plains. Although only the relocated town is under the control of the U.S. Army Corps of Engineers, Tulsa District, its detailed study is a necessary, central part in a reconstruction and scientific analysis of this period of time in the Great Plains. Therefore, the New Chelsea site, 14BU1007, was selected for extensive testing and excavation during Phase III of the El Dorado Lake mitigation project. This report is an account of the preliminary research that has been conducted at the site.

Previous Work

During the summer of 1978, the New Chelsea Site was among six historic sites subjected to limited scale excavation by a crew from the Museum of Anthropology, as part of Phase II mitigation work (Roberts 1981). A total of eight 1x1 meter units were opened at the site and surface collections were made. Work at the site was limited since it had not been identified until the final week of the Phase II field season.

The eight excavation units were placed between the ruins of Chelsea school and a concrete foundation in the northern half of the town. No structural evidence of the town, with the exception of a gravel walk constructed for the school in 1874, was recovered from the units. However, the excavations did produce a quantity and variety of artifacts from Chelsea's material culture. These data, coupled with the richness of the surface collections, indicated that the New Chelsea site contained deposits that warranted further investigation. For a more detailed description and interpretation of these 1978 data, see our report of Phase II (Roberts 1981).

Documentary research by the historian provided additional data that suggested the fruitfulness of further investigation of the New Chelsea site. Specifically, the historian located two plats of relocated Chelsea and records that could be exploited to produce an economic perspective on the town's rise and fall. Exploitation of such documentary data in conjunction with the archaeological potential of the site would allow the New Chelsea site to contribute substantially to developing an anthropological perspective on the historic western community.

Chelsea - The Town

Like other Great Plains towns, Chelsea provided a link between the surrounding, outlying nuclear family settlements and the remainder of the world. It was the place where farmers could sell their goods and purchase those produced by others. As the county seat, Chelsea was the legal and political center of the county. Religious, social and educational

activities centered about the town. Chelsea, as were its counterparts throughout the Great Plains, was a central place, performing central functions for the rural populace while remaining small (cf. Wilk 1981; Hudson 1979: 107).

Chelsea was an inland town, i.e., not on a railroad. Such towns generally thrive during the initial pioneer period but usually succumb after a railhead is established (Hudson 1977: 114). In one particular study of county seats, the lack of a railroad was among the four most common reasons for such towns to lose their political position (Smith and Davidson 1975:35). When the townspeople were particularly determined to maintain a town, translocation was not unusual as a response to declining fortunes. After Chelsea lost the county seat to El Dorado in 1864, members of the community, specifically George Donaldson, took such a course of action. The translocation began ca. 1868, and by 1870 the town was formally relocated with a new town company and a state charter. The town prospered for a few years, but by 1878 it had failed again and was undergoing a slow dying process.

At the present time, little is known about the physical appearance and layout of original Chelsea. There is a record of a plat having been made, but extensive documentary research among state and county records has failed to uncover it. Fortunately, translocated Chelsea is better documented.

Two plats of the New Chelsea site have been located. The first is a hand-drawn plat believed produced ca. 1868 (Fig.10.1). The second is an 1882 transcription of a surveyor's plat drawn in March, 1870 (Fig.10.2). A comparison of the two shows several inconsistencies. However, by using the legal description of the town contained in the town charter, it was possible to reconstruct a plat of the town that is believed to be accurate (Fig.10.3).

Translocated Chelsea occupied approximately one eighth of a section of land owned by George Donaldson. Donaldson's residence, in fact, is shown as the southern boundary of the town on both plats. The presence of the town on Donaldson's land is indicative of his important involvement in attempting to resuscitate the economically choking Chelsea. His premature death in 1869 is believed to be a significant contributing factor to the ultimate failure of the translocated town.

Chelsea was 145 rods and 9 feet (2401.5 feet, 731.98m) north to south and 60 rods and 8 feet (998 feet, 304.19m) east to west. It was comprised of 31 blocks set aside for commercial or residential lots and one block for the public square. Blocks along the east and west boundaries of the town were single blocks of four lots each, the remaining parcels were double blocks with 16 foot alleys and eight lots each. Lots outside the business district which surrounded the square, measured 55 x 120 feet. Those lots fronting the square on the east and west were 22 x 110 feet and those on the north and south, 24 x 110, providing 40 business lots on the square. Roads that passed through the business district were 90 feet wide, all others were 66 feet with the exception of the northern-most which was 57 feet, 6 inches.

This formal arrangement of the town is significant in several respects that will be discussed. Cultural geographers have defined this as a "block

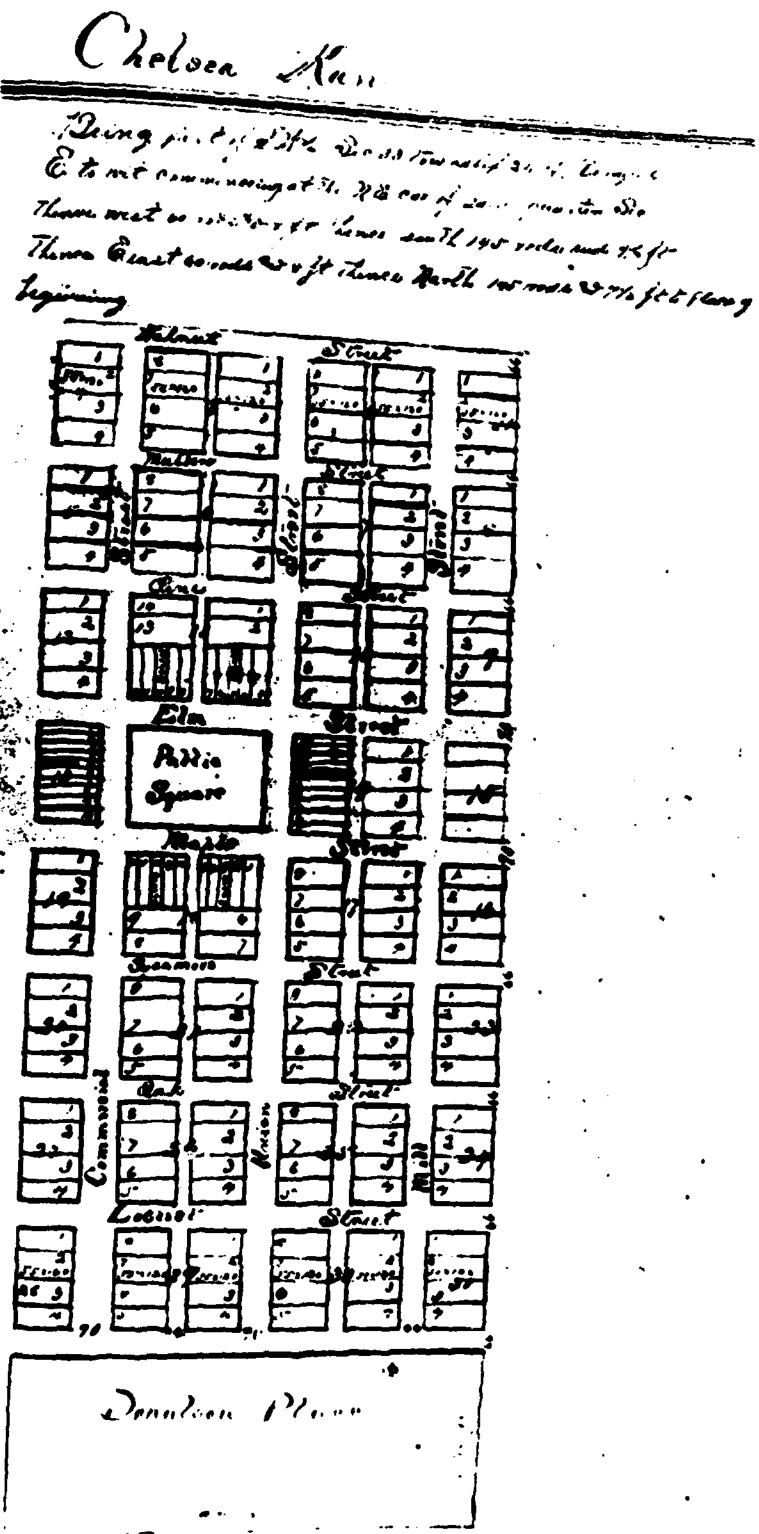


Figure 10.1. Ca. 1868 hand-drawn plat of Chelsea.

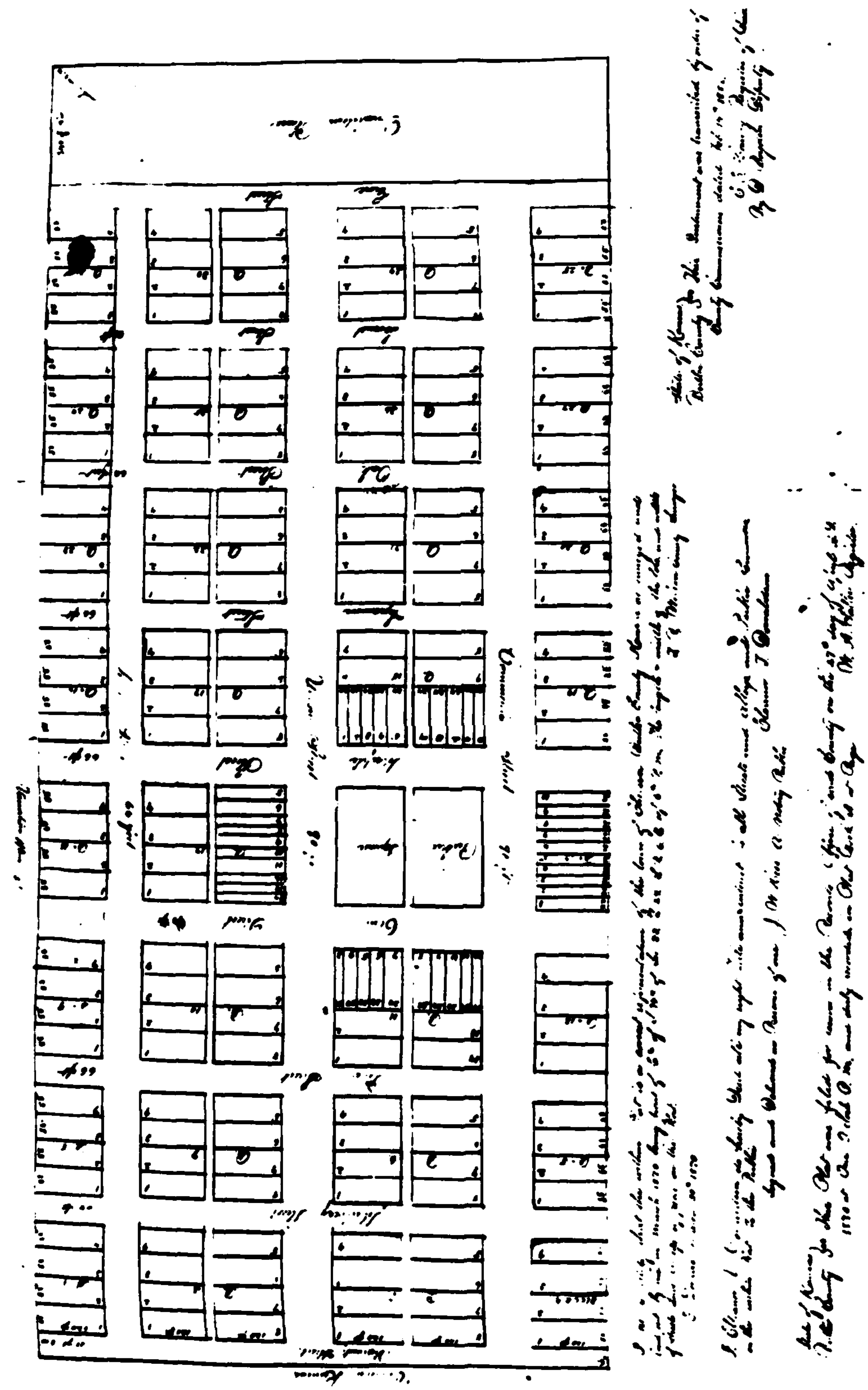


Figure 10.2. Transcription of 1870 surveyor's plat of Chelsea.

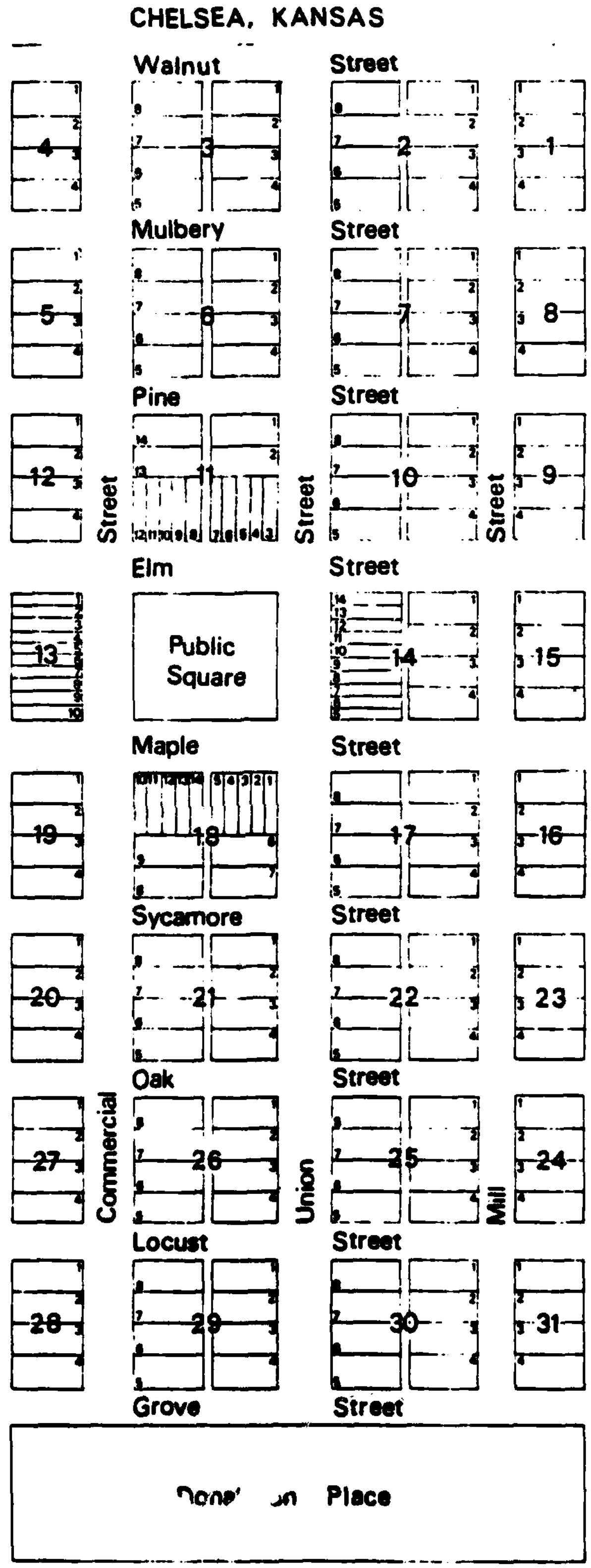


Figure 10.3. Composite plat of Chelsea.

square" town pattern (Price 1968:30). The prototype of this pattern can be traced to the 17th Century in the New World, but the first significant occurrence of the design was in a number of towns in southern middle Tennessee during the early 19th Century. These towns were all county seats and laid out so that a courthouse sat in the center of a centrally located square. This distinct pattern has been designated "Shelbyville" (after Shelbyville, Tennessee). The block square pattern is a derivative of the Shelbyville pattern distinguished by the lack of a central courthouse.

From its point of origin the Shelbyville pattern spread. It became most popular in the states of Indiana, Illinois, and Iowa, but was common throughout most of what is referred to as the second American frontier. By noting the dates of occurrence for towns of this design, a westward trend in the spread proceeding through the aforementioned states can be detected during the first half of the 19th Century. At the culmination of this expansion are the only two recorded instances of this pattern in Kansas, one in 1857 and the other in 1860 (Price 1968, Fig. 16). Chelsea now raises that to three recorded instances.

Innovation in town design was rare, people generally copied other towns (Price 1968:29). The conservatism of rural town planners appears to be born out by Chelsea, because the areas where the Shelbyville pattern was the most popular are the same areas from which the settlers who established the town came.

There can be no doubt that the Chelseaites intended eventually to put a courthouse in the square (after winning back the county seat), although most Kansas towns have the courthouse outside the business district, as is the case with El Dorado. Since this pattern is so rare in Kansas it can be surmised that the design was part of the cultural baggage that the settlers brought with them. Aside from familiarity, this pattern had several other characteristics to recommend it: it is a simple design, easy to lay out and it conforms well with the township-range system of demarcating the land.

One of the prime considerations in moving the town was to increase the possibilities of obtaining a railroad, yet the town was not platted in the manner typical of other Plains towns anticipating a spur (a railroad line). Generally towns anticipating a railroad were of the form known as "T-town." Such towns retained a rectangular grid but were oriented according to where the railroad would intersect them (Hudson 1977:103). The absence of this design suggests that the Chelsea planners, while hoping for a spur, were realistic in assessing the probabilities of obtaining a line and platted the town in the most convenient manner.

Excavation Method and Differential Agricultural Disturbance at the New Chelsea Site

Approximately 80% or more of the area formerly occupied by Chelsea was, subsequent to the town's abandonment, put under cultivation. Therefore, any large scale investigation of Chelsea would necessitate a research design that would incorporate extracting data from disturbed deposits. The excavations undertaken during Phase II were designed in part to determine the extent to which the recovered data could be used to reconstruct human behavior.

There have been a number of studies demonstrating the potential (and pitfalls) of data recovery from disturbed sites (Binford et al. 1970; Redman 1973; Redman and Watson 1970; Schiffer and Rathje 1973; Talmadge and Chesler 1977; Turbowitz 1976). It was assumed from the outset that surface deposits reflected activity areas. Therefore, historic material surface concentrations were used to place test units.

Limited scale excavation was designed to define areas suitable for large scale investigation. The fieldwork plan called for test units to be placed in the areas where surface concentrations of historic materials were present. Inclement weather forced a delay in harvesting wheat from the field and resulted in an alteration of the excavation plan. The delay in harvesting and the following dry period resulted in poor ground visibility even after the field had been disked twice. It was necessary to place excavation units on the basis of the previous summer's observations.

A datum point, designated 500N 500E, was established at the north end of the field (Fig. 10.4). All test units were gridded in accordance with this datum. The first area of limited scale excavation, the central area, was established in an area near the center of the field. Additional units were placed east and west of the central area in approximate locations where surface scatters were noted during the Phase II survey. These tests did not produce any evidence of town associated features. Work was concentrated on a fifth area, located south of the central Test area with historic material visible on the surface. This area contained minimally disturbed, subplowzone features relating to a blacksmith shop.

Excavation units were 1 x 1 meter squares subdivided into four 50 x 50 centimeter quadrants. Each quadrant was hand troweled in arbitrary 10 cm units. Each excavation unit received a unique number in the sequence in which it was excavated. Quadrants were always numbered 1 through 4, clockwise from the northeast. All material was bagged by unit, quadrant, and level.

Making levels 10 cm thick was an arbitrary decision, based on the convenience of the measure and the familiarity of the excavators with such an excavation strategy. However, removing the plowzone in more than one level was a purposeful decision. This technique permits comparisons to be made between the upper part of the plowzone and the lower, thus providing a limited amount of control to study the differential affects of shallow or surface disturbance versus deeper disturbances.

"Plowing" is often used as a generic term for any type of agricultural soil disturbance. The resulting lateral displacement of artifacts is attributed to "plow drag" (Roper 1976:32). However, plowing is only one of a number of farming activities that can result in the disturbance of an archaeological deposit. The type of soil disturbance a given field has been subjected to is a function of what was being planted, what had previously been planted, the geographic location of the field, the time period of cultivation, and the specific agricultural techniques employed. A general division can be produced by distinguishing between those techniques that primarily disturb the surface and upper centimeters such as disking, planting, harvesting, etc.; and those that penetrate deeply beneath the surface, i.e., plowing, deep disking, furrowing, etc.

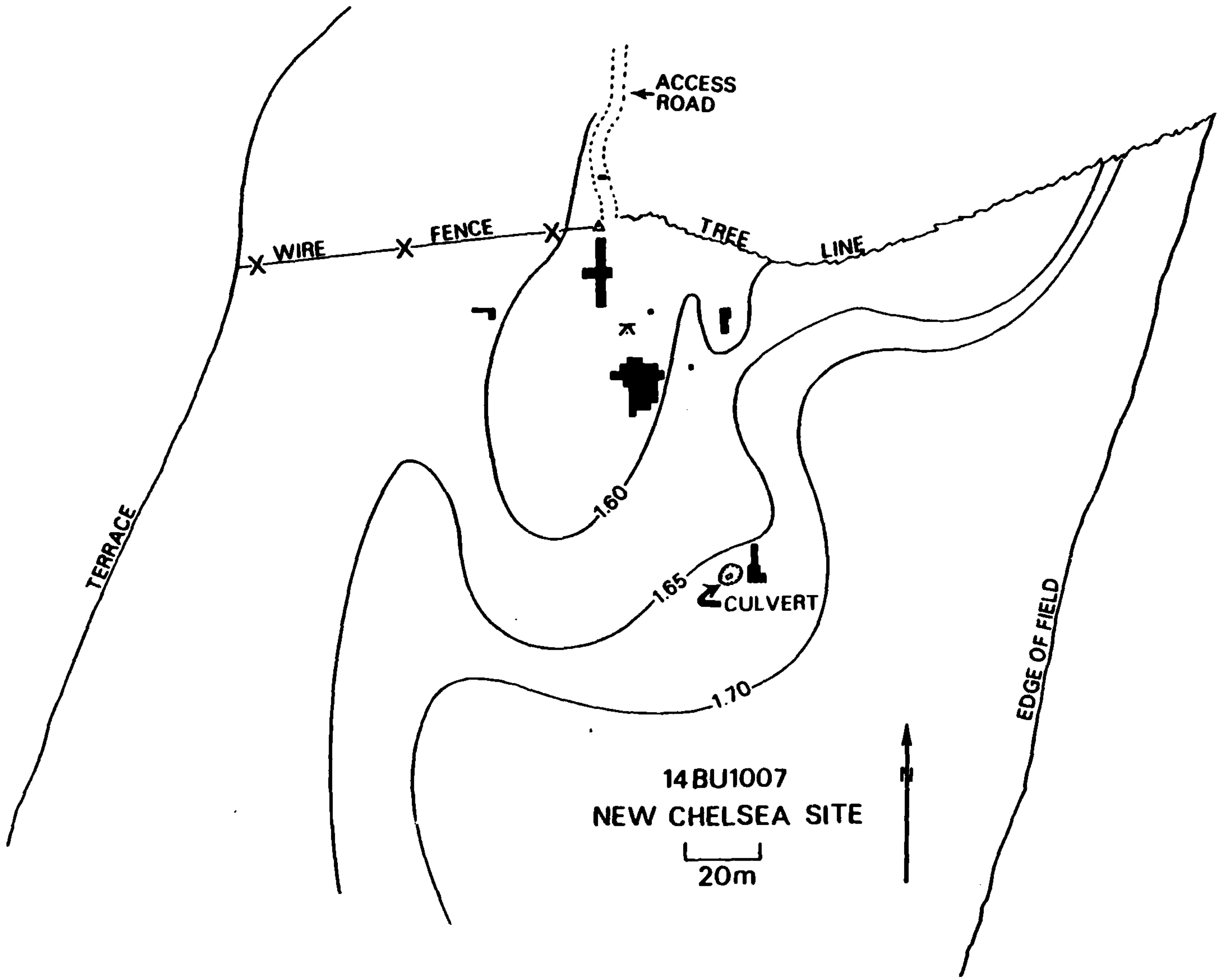


Figure 10.4. New Chelsea site excavations

That portion of the New Chelsea site under investigation during Phase II had been a wheat field since ca. 1900-1910 (T.R. Holderman, former land owner, personal communication). At the time it was first cultivated and several decades thereafter, the steel plow was the most common form of soil disturbance. This was true plowing, i.e., cutting to the maximum depth that the soil will be broken and inverting the soil. After the "Dust Bowl" years of the 1930s, new, less soil destructive means of cultivation were employed. True plowing is now infrequent; shallow disking, affecting only the surface and several inches below it, is now most frequent. Interviews with area farmers indicate that a depth of 3-4 inches was the common disk penetration (approximately 10 cm).

It was hypothesized that surface techniques produce more lateral displacement of artifacts than true plowing does. The test implication is that artifacts from level 1 will show greater dispersion through the excavation while those from level 2 will conform more closely to the original depositional pattern. When levels 1 and 2 from the block excavation centering on the blacksmith shop are compared it can be seen that the distributions from level 2 correspond with postulated disposal areas, whereas the level 1 distributions indicate more randomly distributed artifacts (distribution maps can be found below in the artifact discussion section). The most striking example involves the clinker assemblage distributions and Feature 2, a clinker pit. A significantly large number of clinkers was recovered from those units containing and near Feature 2. Similar noticeably large clusters were absent from those units in level 1. In fact, level 1's distribution is far more dispersed than level 2. Using these data it is possible to reject the null hypothesis of no difference in degree of lateral displacement between levels.

Artifacts from the surface and level 1 show more displacement than those from level 2. However, this fact may be attributable to degree as well as type of disturbance, i.e., lateral displacement in level 1 may be due as much to the fact that the surface and first 10 cm are disturbed much more frequently than the lower 10, as to any basic differences in the affects of various techniques. Such a consideration is discounted in this instance because the time during which deep disturbance predominated is estimated to be roughly equal to the number of years surface and shallow techniques have been employed.

An Archaeological Approach to "Community"

The investigation of the New Chelsea site has been expressly formulated to explore an historic community through the techniques of archaeology and ethnohistory. Ultimately this project will achieve (1) a reconstruction of the town and its development, (2) a model of its material culture and the economic links from which such goods derived, and (3) an understanding of how Chelsea relates to other such communities and the settling of the American west. In short, this project attempts to use a community as the focus for archaeological research, in much the same manner that cultural anthropologists have recognized it as a valid unit or object of study (Arensberg 1961).

The following constitute the steps involved in this project:

1. Reconstruct Chelsea through historic and ethnohistoric research.
2. Sample the site through excavation to produce a reconstruction of the town's material culture.
3. Obtain samples of the material culture of outlying settlements.
4. Using both known and unknown historic associations, test the validity of material culture as a means of defining a community.
5. Define and reconstruct economic relationships revealed by Chelsea's material culture.
6. Relate the Chelsea pattern to those other historic communities.

Phases II and III of this project have been devoted to acquiring data specified by the first three steps. In Phase IV these activities will be concluded. The final three steps will be complete during the projected synthesis phases at the conclusion of the fieldwork.

This report focuses on reconstructing a blacksmith shop. Additional data have been presented that relate to the organization of the town. The conclusion will include projections for completing the steps listed above.

Excavations at The Blacksmith Shop

Features

Four subplowzone features were revealed during excavation at the New Chelsea site (Fig. 10.5). All were associated with the blacksmith shop. A discussion and interpretation of each feature is presented below.

Feature 1 was a concentration of brick and limestone encountered as the first test unit in this area was excavated (Fig. 10.6). It averaged approximately 40 cm in diameter. This diameter was maintained to the bottom of the feature at 33.5 cm below the surface. The soil around the feature was noticeably harder than that in the other units. It could almost be classified as baked, but there was no direct evidence of burning.

Most of the brick occurred in the upper portion of the feature. None was present at the bottom. The brick had an orangish color, a high sand content, and limestone inclusions. Based on comparisons with other brick specimens, it is suggested that these were locally produced. Some of the pieces had mortar adhering, although neither brick nor limestone in the feature were mortared together.

The pieces of limestone were irregular field stones varying from more than a kilogram to a few grams (gravel) in size. The area around the feature once had a limestone cobble layer, therefore some of the smaller pieces may have been mixed in over the years of disturbance. Mortar did not adhere to any of the limestone pieces but bits of mortar were recovered throughout the feature. A number of the pieces, particularly those near the top, had a chalky texture typical of limestone that has been burned. However, there was no sign of heat discoloration.

The appearance of Feature 1 was not unlike that of Feature 3, a post support, at 14BU1008 (cf. Brown, this report). However, there was no evidence of a post stain in Feature 1. The feature is interpreted instead as the foundation for a forge. This interpretation is based upon the feature

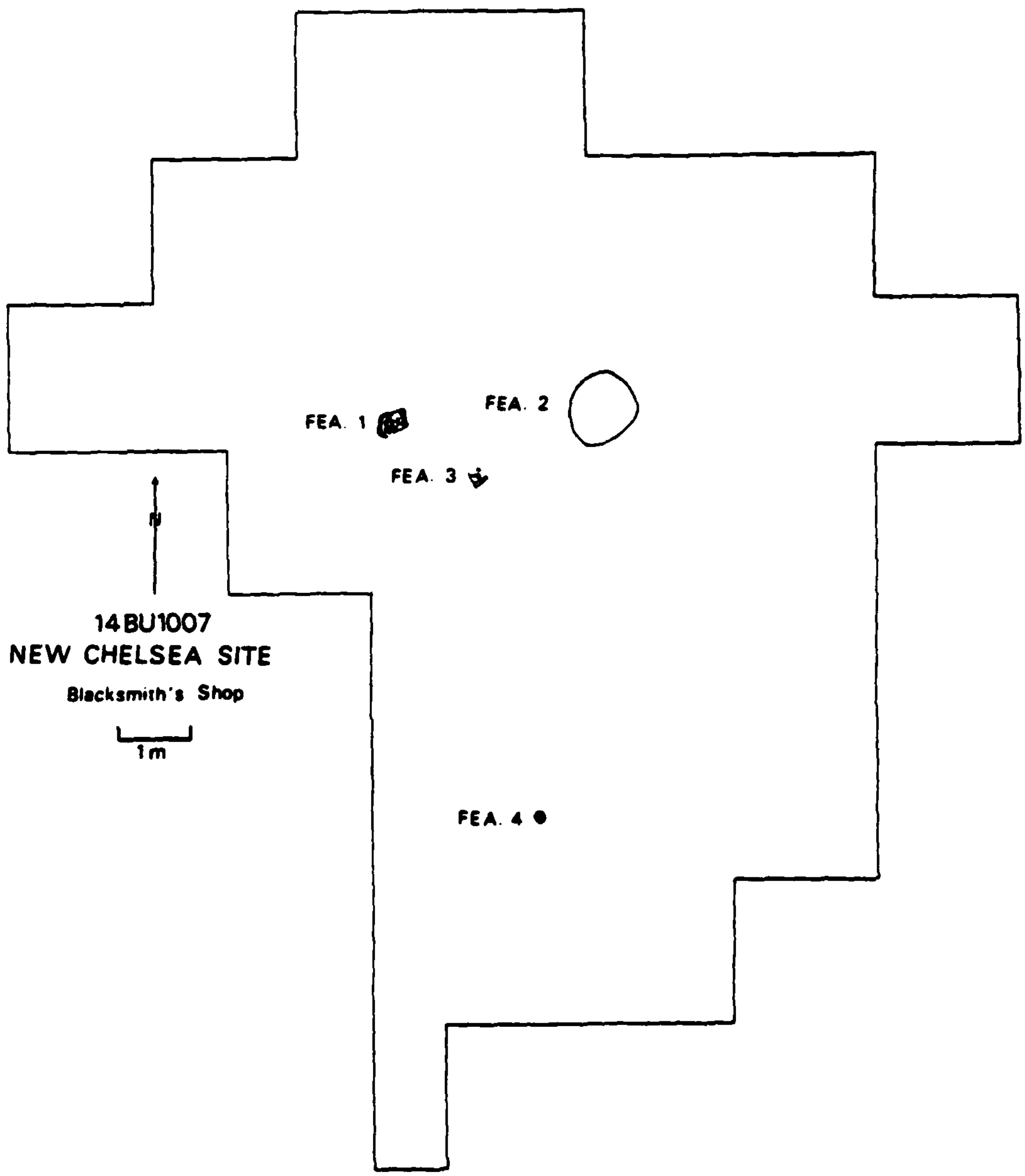

FEA. 1
FEA. 2
FEA. 3
FEA. 4
N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m

Figure 10.5.

Figure 10.6. Feature 1, brick and limestone concentration.

being present in what is undoubtedly a blacksmith shop and the evidence of prolonged heat (chalky limestone and hard, baked-out soil) without any signs of direct burning. The interpretation is supported by the relative sparseness of artifacts around the feature (see distribution maps under ARTIFACTS) - a smith had to maintain a debris free working area around his forge.

The forge itself was probably mortared brick resting on the unconsolidated limestone. Assuming that the foundation remnant is indicative of the feature's original size it can be estimated at the forge had a minimum diameter of approximately 40 cm. Considering the amount of disturbance to which the feature has been subjected, a forge diameter of 1.5 feet or approximately 46 cm, would not be unrealistic. Typical height for a general purpose forge was 20-22 inches (50-56 cm) (Richardson 1978 (3):39). It cannot be determined from the evidence on hand whether the forge was round or square. Several small pieces of metal with mortar adhering suggest that metal parts were incorporated in the forge, possibly a blower or other aid. A forge of this size was large enough to maintain the four to five inch fire-pit used by a smith. The baked out soil around the feature indicates that fairly high temperatures were maintained for extended periods of time, but also reveals that the forge was inefficient, allowing heat to escape through the brick and limestone and into the surrounding soil.

Feature 2 was a truncated, basin shaped, clay-filled pit east of Feature 1 (Fig. 10.7). It was basically circular in plan view with a maximum diameter of 1.05 m. In profile, it had a maximum thickness of 13.5 cm. The feature was first recognized as a dark, organic looking stain with clay mottling. A quantity of clinkers were recovered directly over and in the upper centimeters of the feature. During cross sectioning, it was noted that the clay mottling became more pronounced and that only small fragments of artifacts were recovered below the 20 cm level.

This feature is interpreted as a clinker pit, an area primarily used for the disposal of forge cleaning debris. Its original ground surface diameter is estimated at approximately 1.5 m. The clay in the pit and its size suggest that it may once have been used to store or mix clay as in ceramic manufacturing. It was earlier postulated that the forge bricks were locally produced, thus this pit may have been used in their manufacture.

Feature 3 was a limestone filled pit one meter southeast of Feature 1 (Fig. 10.8). Along its longest axis it measured 39 cm. This feature extended to a depth similar to that of Feature 1, but unlike the latter, constricted so that it had a cone shaped profile. A few fragments of miscellaneous iron were recovered among the field stones that comprised the feature, but there was no brick.

Due to its proximity to the postulated forge, Feature 1, and the relative lack of debris associated with it, Feature 3 is interpreted as the foundation for the blacksmith's anvil. The anvil had to be situated so that the smith could move easily along an arc between it and the forge while close enough that the metal would not cool in the interim. Most likely, the anvil itself was rooted to a large timber block. Such a block was often anchored in the ground, sometimes as much as three feet (Hogg

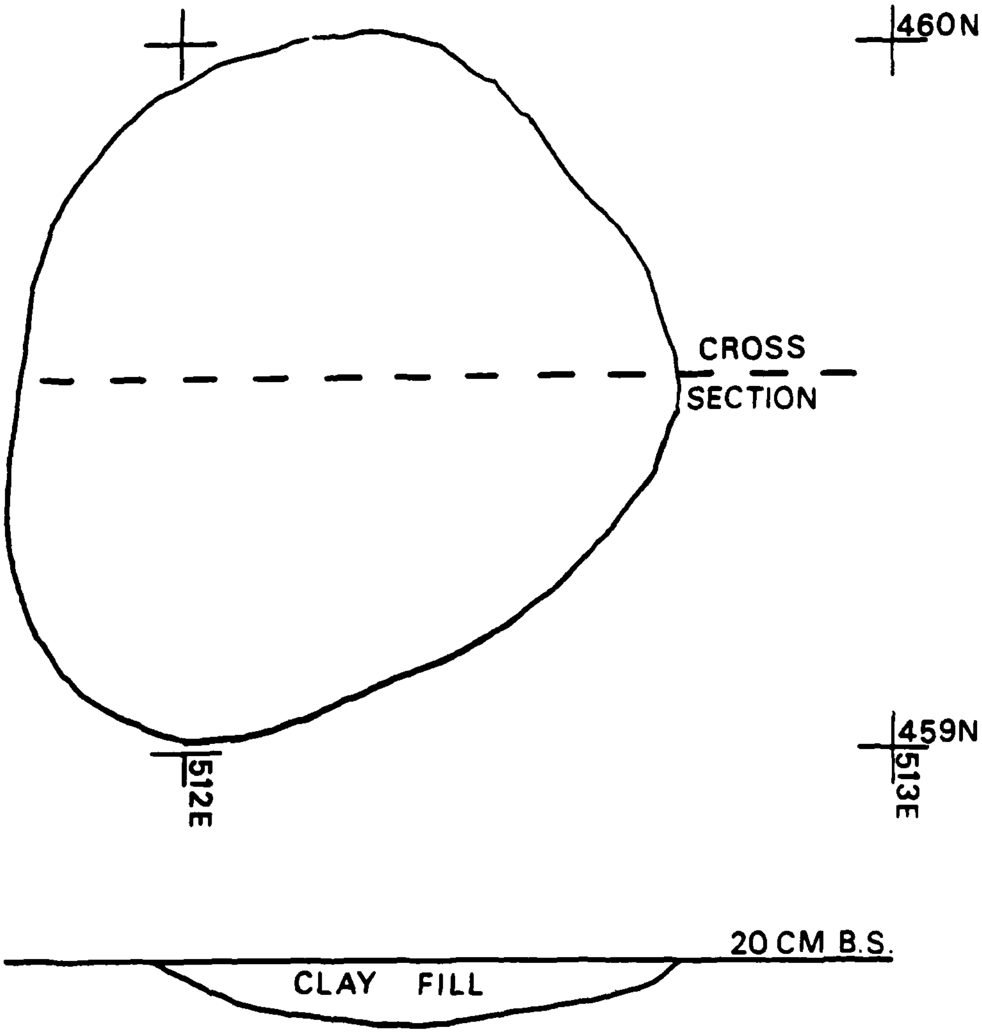


Figure 10.7. Feature 2. clay-filled clinker pit. Planview, top; cross-section, bottom.

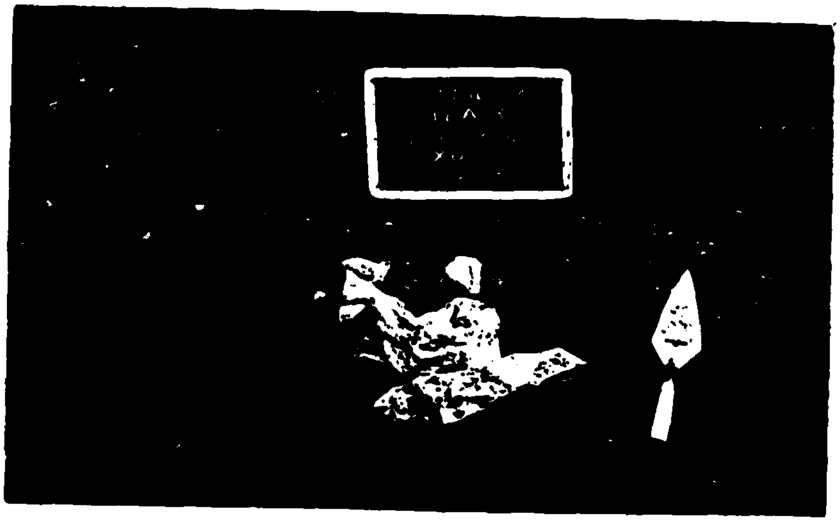


Figure 10.8. Feature 3, limestone-filled pit.

1964:43). In this instance limestone replaced a portion of the block. It is possible that Feature 3 was originally 50 cm or more in diameter, thus making it capable of supporting a massive block. The limestone would have helped maintain a constant height for the anvil by preventing the repeated blows from driving it into the ground.

Another possible interpretation is that Feature 3 represents a bosh, a source of water in which hot metal is doused or quenched for tempering (Hogg 1964:32-3). The poor permeability of the Ladysmith soil into which the pit was dug would allow water to stand for extended periods of time. The presence of limestone in the pit can be explained by an old blacksmith's belief that dousing in limewater helps strengthen a metal's temper (Dr. Leland Miller, amateur blacksmith, personal communication). This explanation is discounted for several reasons: (1) using a pit as a bosh risks soil contaminating the hot metal; (2) even though the soil has a low permeability, such a pit would require more frequent replenishing than the more typical tub or trough; (3) a ground level pit at this distance from the forge would be awkward for the smith; and (4) such a pit would be too shallow.

Feature 4 was a circular stain in the southern portion of the excavation. It had a diameter of 18 cm but a depth of only 4 cm below the plowzone. A large fragment of brick was recovered in association with Feature 4. Although originally thought to be a post stain, the shallowness of the feature prevents any cultural interpretations.

Artifacts

The artifacts recovered during the excavation of the blacksmith shop reflect the wide range of activities associated with such an important industrial enterprise. By identifying the various tools' distributions it is possible to learn how this blacksmith organized his work behavior.

In exploring an historic site, particularly a late 19th century site, the importance of the individual artifact is sometimes subjugated in favor of emphasizing the class or assemblage of which it is a part. Most of the tools and other artifacts recovered are similar if not identical to their modern counterparts. Few exhibit any attributes useful in determining chronology or place of origin. Unlike prehistoric artifacts where detailed descriptions are necessary to justify classifications, a name generally suffices to identify an historic tool. None of the artifacts recovered are so far removed from modern material culture as to be unrecognizable when identified by name. Therefore, this section will emphasize assemblages. Two types of assemblages will be used: activity sets (tool assemblages used in specific work behaviors such as metal working, woodworking, farrier, etc.) and use sets (assemblages comprised of artifacts that can be used for similar functions in different activities, i.e., nails, nuts and bolts, bottles, etc.). The distribution of these assemblages will be illustrated and discussed and constituent artifacts will be identified.

It is important to note that few complete artifacts were recovered. Over 95% of the excavated items are fragments. Therefore, counts may be misleading. Where possible minimal numbers will be discussed.

Flat Glass

A total of 104 fragments of flat glass were recovered, 57 and 47 from levels 1 and 2, respectively. Most of these fragments probably represent window glass although several colored fragments are most likely from panel bottles (Table 10.1).

Walker (1971) has suggested that window glass thickness can be used as a chronological indicator. His comparative data indicates that window glass produced after 1845 is 4/64" (1.59 mm) or greater in thickness. By excluding the three colored fragments from level 2, a total of 44 possible window glass fragments remain, of which 81.8% (36) are greater than or equal to 4/64" in thickness. The flat glass correctly indicates a post-1845 occupation.

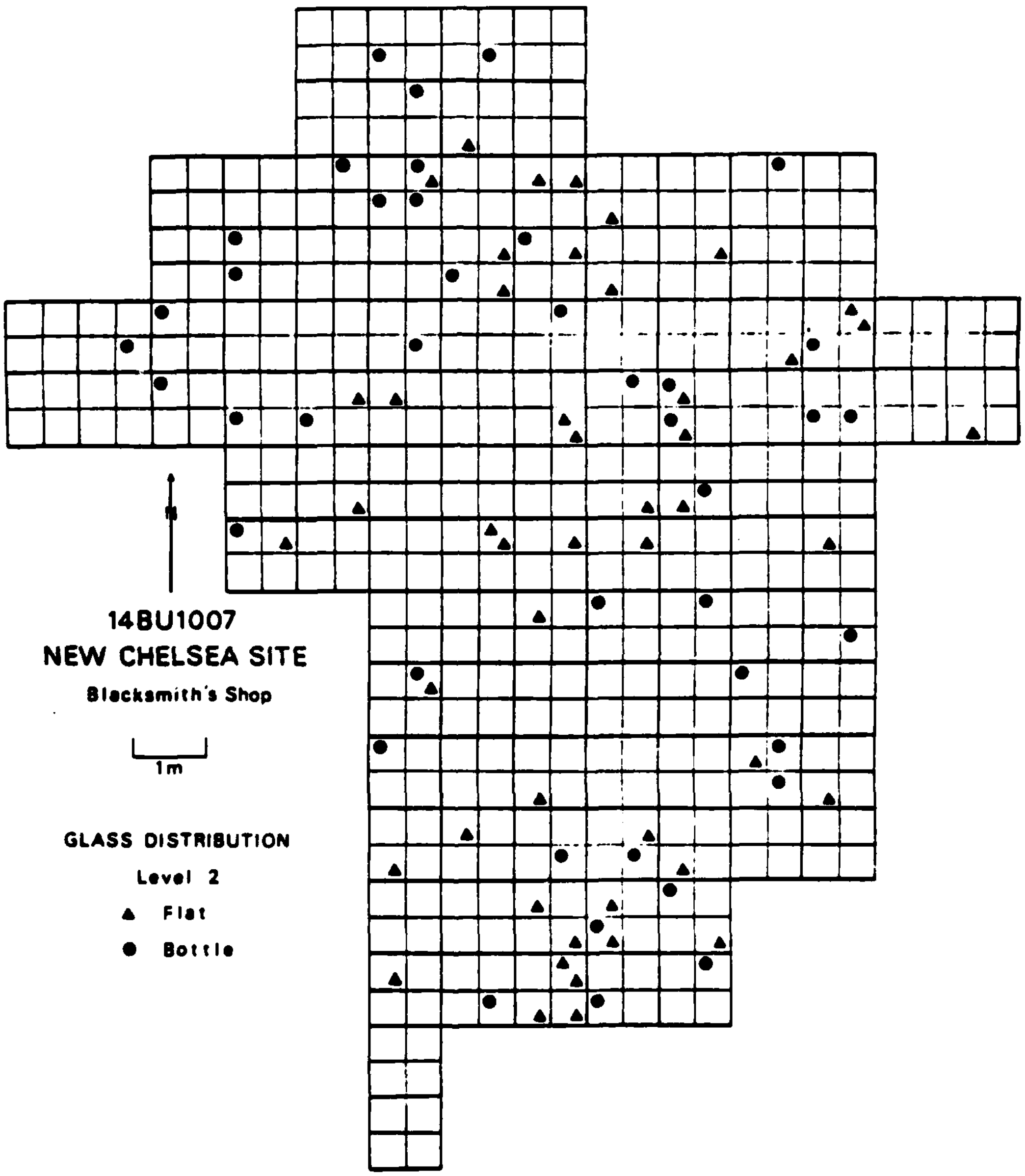
Table 10.1. Flat glass color.

Color	Counts Level 1	Level 2
Amber	3	1
Aqua	1	2
Clear	21	18
Green Tint	32	26
	57	47

There are three discernable areas of flat glass occurrence (Fig. 10.9): the north-central units, south-central units, and Feature 2. Although the number of contiguous units comprising these areas of "concentration" is not as large as in other artifact classes, an inspection of the distribution map clearly shows their presence. Each concentration consists of clear and green tinted glass only. The colored specimens occur outside the concentrations.

Although flat glass appears in most of the portions of the excavation, it occurs most frequently in the eastern units. An arbitrary line passing through the east-west midpoint places 72% (34) of the flat glass specimens in the east half. A north-south division does not show as distinct a variation, revealing 57% (27) of the pieces are in the southern units.

The presence of flat glass is problematical. There is no evidence for a structure, which questions the designation of window glass. However, the fragments may well have originated from carriage windows. Most of the pieces were recovered from the east half of the excavation, which is believed to be primarily a disposal area. This suggests that most were discarded. Therefore, these fragments may represent discarded carriage panes.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14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
GLASS DISTRIBUTION
Level 2
Flat
Bottle

Figure 10.9.

Bottle Glass

A total of 97 bottle fragments were recovered, 55 and 42 from levels 1 and 2 respectively. Aqua colored fragments comprise 42.8% (18) of the level 2 assemblage, followed by clear, sea green, amber, green tinted, and light manganese or amethyst (Table 10.2).

Table 10.2. Bottle glass color.

Color	Level 1	Level 2
Amber	8	4
Aqua	26	18
Clear	7	7
Green Tint	5	4
Light Amethyst	5	2
Sea Green	4	7
	55	42

Three specimens, all aqua colored, bear fragments of embossed labels. The three are an "-OD P-", "INC", and an "o" or "c". It is possible that the "-OD P-" is a fragment of the words "blood purifier." The style of the lettering resembles that on a "LYDIA E. PINKHAM'S BLOOD PURIFIER" bottle illustrated in Baldwin (1973:389). It should be noted that another Pinkham product was recovered at 14BU1008, not far from this site (see Brown, this volume). Pinkham's products were common in the latter decades of the 19th Century and were available in the area; this may be an additional specimen. The other fragments are unidentifiable.

Only one bottle neck was recovered from level 2. It is a light amethyst colored fragment of a bottle blown in an open mold. The mold seam stops just below the hand-tooled lip. A string rim 1.2 cm (.5") below the lip was part of the mold. Such neck finishes are generally found on medicine or extract bottles.

Bottle glass has a fairly uniform distribution throughout the excavation (Fig. 10.9). Because most of the flat glass was recovered from the eastern units, bottle glass appears particularly prominent in the west half, especially the northernmost units. It is significant that bottle glass dominates in the western units, as this area was nearest the street. Limited scale excavation in the street and a Chelsea walkway (Roberts 1981) have shown bottle fragments to be common in such areas. Thus, these bottle fragments may have been moved into the shop area from the roadway.

Ceramics

The distribution by level of ceramic types is detailed in Table 10.3. All represent basic utilitarian wares with white glazed ironstone predominating. These could represent fragments of ceramic vessels used by the smith for assorted purposes. The presence of the two smoking pipe fragments does suggest a little about the personal behavior of the smith.

However, it is possible that the pipe was lost or discarded by a visitor (a blacksmith shop was often a favorite gathering place for townsmen). The distribution map of the five level 2 specimens shows that all occur in probable refuse areas (Fig. 10.10). Ceramics from the blacksmith shop and their significance are more fully discussed by Anderson (this volume).

Table 10.3. Ceramics.

Type	Counts Level 1	Level 2
Earthenware		
Unglazed/Unglazed	1	
Ironstone		
White glazed	3	2
Semi-porcelain		1
Stoneware		
Albany/Albany		1
Tan/Albany	1	
Yellow/Brown		
Glazed Smoking Pipe	1	
Pipe Stem		1
	6	5

Blacksmith Tools

Table 10.4 details the variety of tools recovered during the excavation. The nature of the assemblage reflects the number of varied tasks that a blacksmith was called upon to perform: general metal working, tool making and repair, leather work, machine repair, etc. (Recovered tools associated with tasks not necessarily performed by a blacksmith, such as woodworking, are covered in separate sections.) Although a smith had a number of specialized tools at his disposal (cf. Hogg 1964, Spivey 1979, and Webber 1972), his basic tool kit was comprised of hammers, chisels, punches, tongs, and an anvil. With these few multifunctional tools, a properly trained smith was capable of performing most metal working tasks. Of this minimal collection, only hammers are not directly represented in the assemblage.

The distribution of the tools is shown in Figure 10.11. There is no clear concentration. Most of the specimens occur near Feature 2 or in the southeast portion of the excavation.

All of the tools are fragments but many appear to have been cut rather than broken (Fig. 10.12). This is particularly true of the chisels, punches, tool heads, and handle inserts. The prevalence of this attribute in the assemblage suggests a common smith activity: the reworking and reusing of tools. An example is A97185320003, an improperly ground working end of a chisel that has been cut from its body. The smith may have

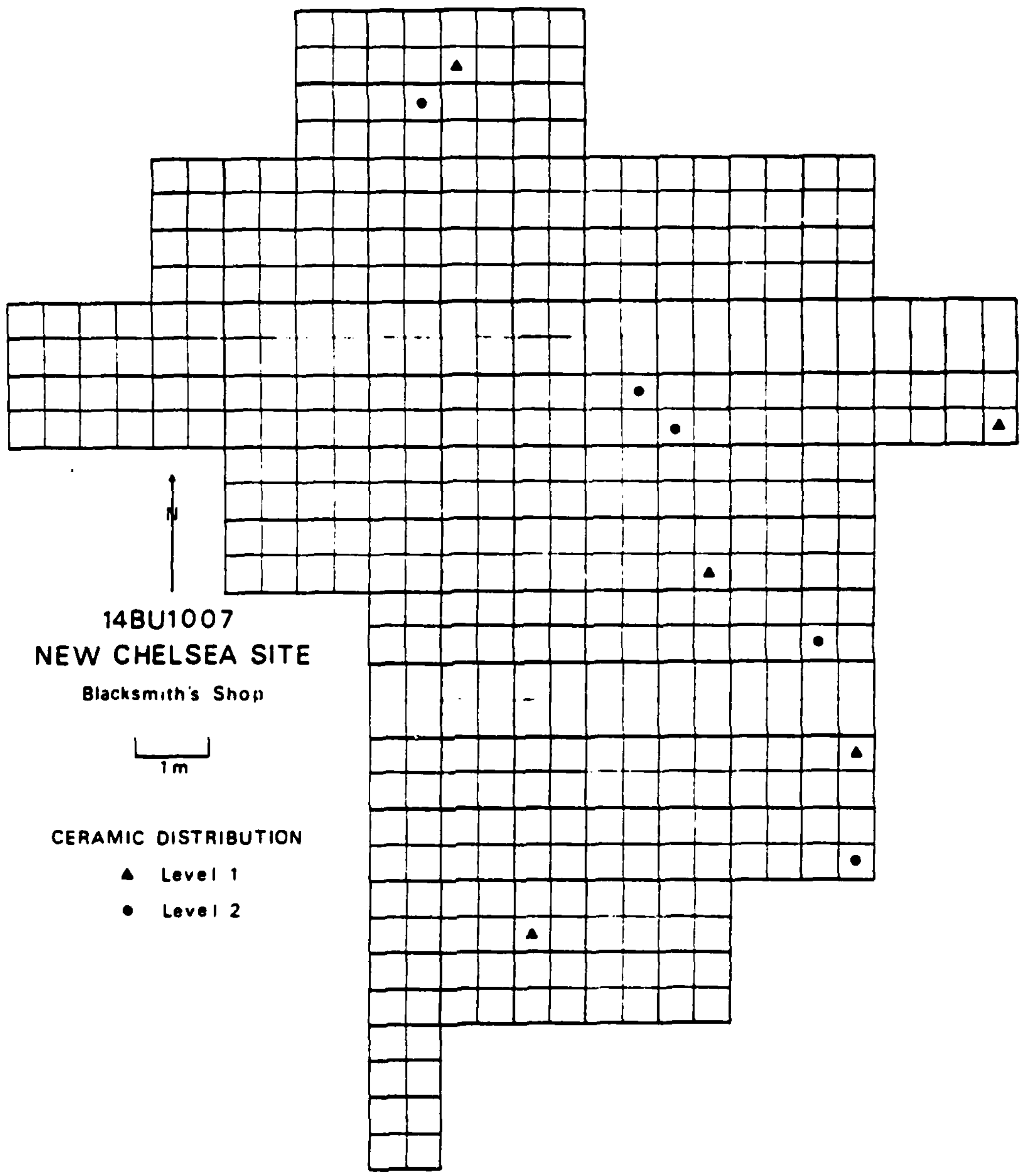

14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
N
1m
CERAMIC DISTRIBUTION
▲ Level 1
● Level 2

Figure 10.10.

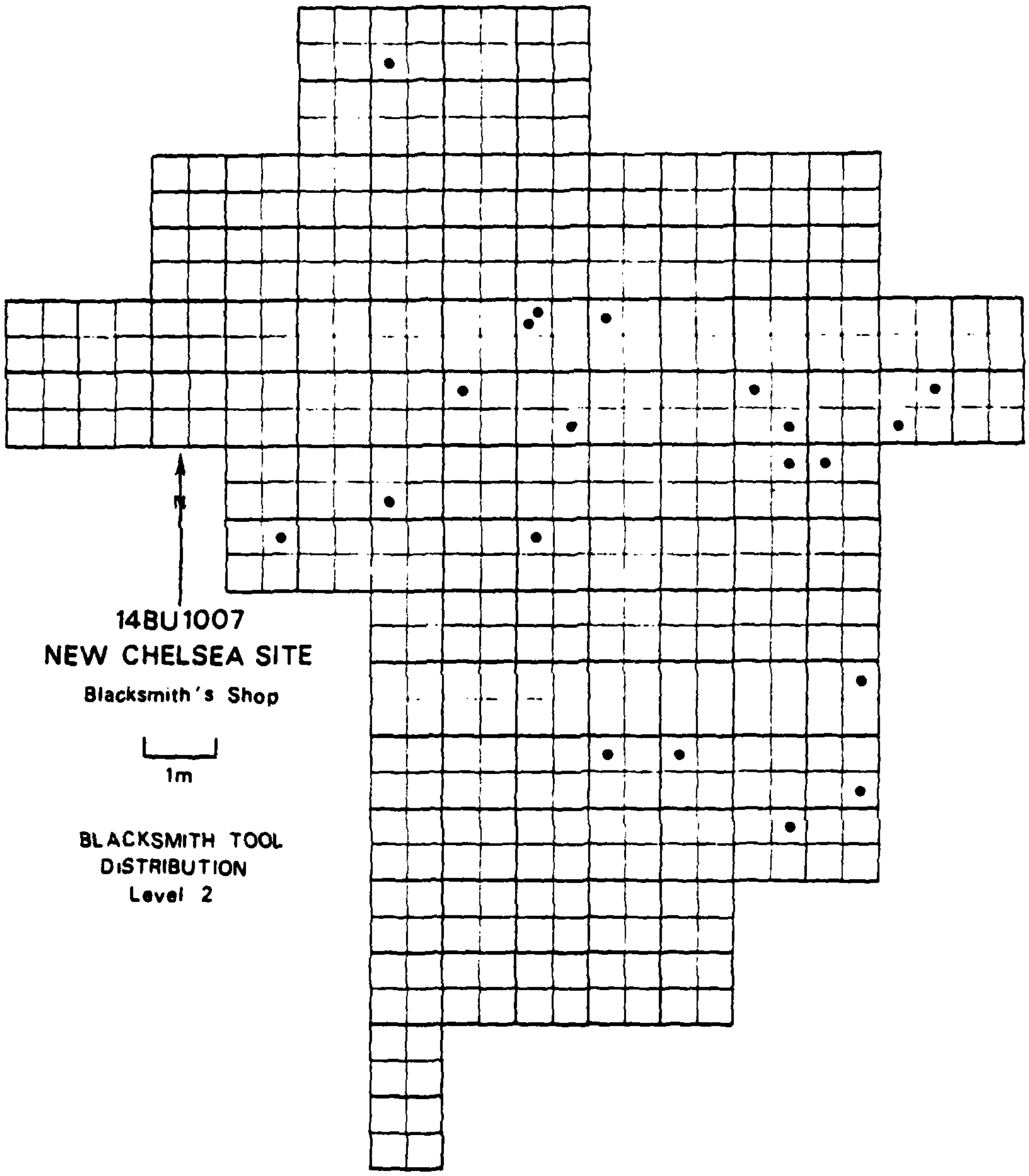

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
BLACKSMITH TOOL
DISTRIBUTION
Level 2

Figure 10.11.

Table 10.4. Blacksmith tools.

Type	Counts Level 1	Level 2
Chisel	4	3
Cotter Pin		1
Eye	1	
File	1	
Fuller	1	
Gear	1	
Handle Insert	2	
Heading Tool	1	
Needle	1	
Pin		1
Pliers	1	
Punch	2	2
Screwdriver	1	3
Socket	1	
Tang	2	1
Toe Calk	2	1
Tongs	1	
Tool Head	2	2
Washer	1	1
Wedge		3
Wrench		3
	25	21

reworked the body into another chisel or adapted it to another function. It should be emphasized that no tool bodies were identified in the assemblage.

A significant member of this assemblage is A97181410001, a fragment of a large cast-iron gear (Fig. 10.12). Wear on the teeth indicates that the piece moved counter-clockwise. Curvature in two directions indicates that the gear was mounted with its teeth at an angle to the ground. It had a bowl shaped interior with an interior orifice just one inch from the teeth. Spivey (1979:179) shows a post drill with gears similar to this one. This fragment is the only evidence recovered for tools other than simple, handheld implements.

Blacksmith Miscellany

This assemblage includes the "raw materials" used by a smith and the detritus of his work. Table 10.5 provides the distribution by level of the "raw materials" or stock pieces - iron bar, rod, specialized bar, and sheet or plate iron. This is the material that a smith used every day in his manufacturing and repairing. As can be seen, the most common materials are the standard bar and rod in varying widths and thicknesses that a smith purchased in lengths of multiple feet from his supplier. The specialized bar probably represents the material not generally kept on hand but

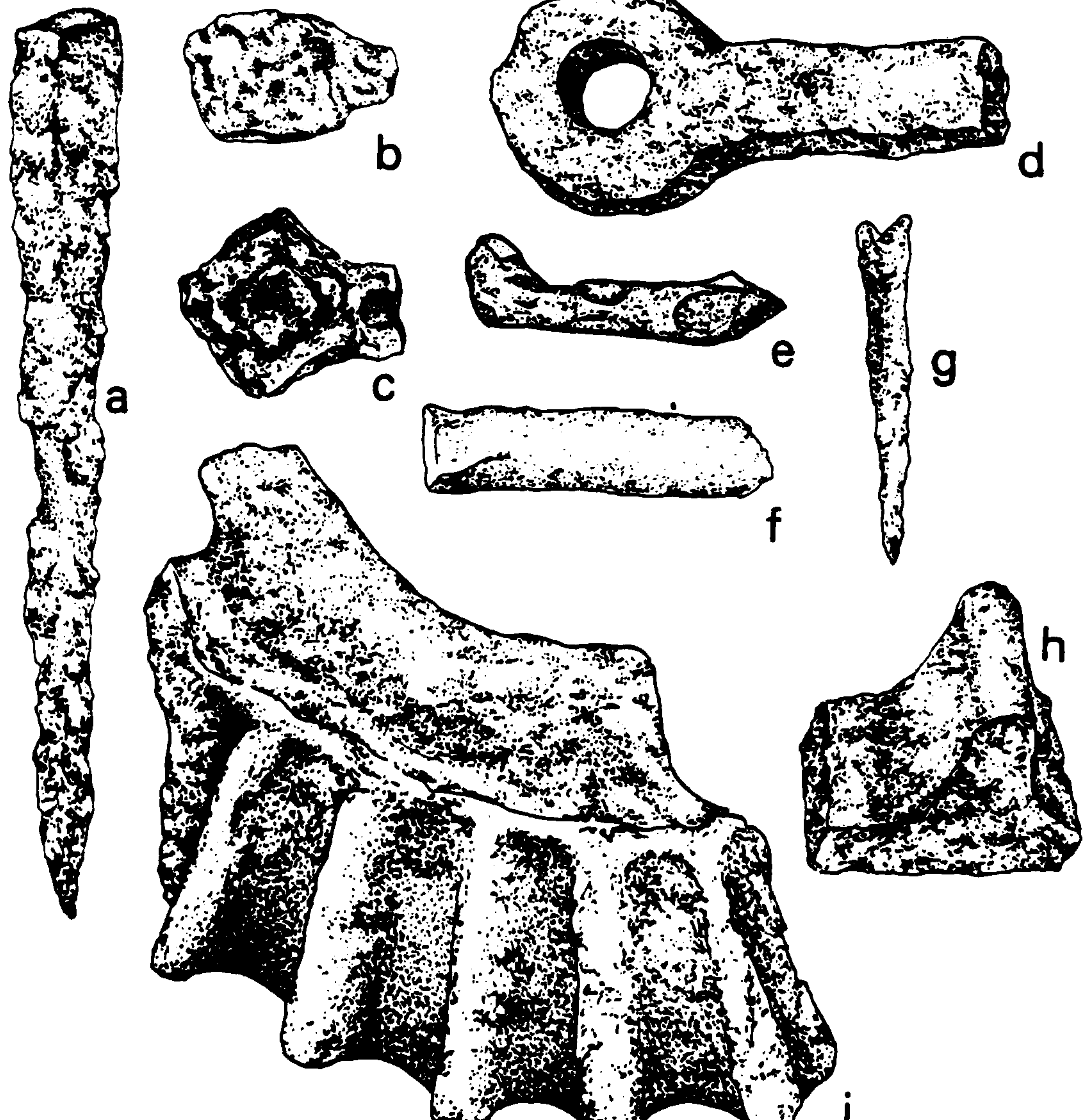


Figure 10.12. Blacksmith tools: a. A97141110001, punch; b. A97085420011, screwdriver head; c. A97085420017, wrench; d. A97182210002, heading tool; e. A97151410003, toe calk(?); f. A97121110003, chisel; g. A97139410001, needle; h. A97173410003, fuller; i. A97181410001, gear. Actual size.

Table 10.5. Blacksmith miscellany.

Type	Counts Level 1	Counts Level 2
Bar	223	189
Plugs	4	5
Rod	49	50
Sheet Iron		16
Specialized Bar		
Banding	2	
Bevel Edge		
Shaft Steel	4	
Double Bevel		
Shaft Steel	4	
Half Oval	1	
Heavy Band		1
Oval Edge		
Shaft Steel		2
Oval Iron	1	
	288	263

	Weights (grams) Level 1 Total	Level 1 Mean	Level 1 S.D.	Level 2 Total	Level 2 Mean	Level 2 S.D.
Clinkers	10,829.1	23.75	28.88	9,862.7	21.63	7.68
Misc. Iron	1,926.4	4.22	7.68	2,876.7	6.309	9.2

acquired for particular needs. Virtually all of these specimens represent stock trimmings, most fewer than 5 cm long. Such trimmings would result any time a piece of stock was altered.

Although trimmings are technically detritus, this term has been reserved for clinkers and miscellaneous iron. Clinkers are the consolidated amorphous mass of ash, charcoal, and metal that form the residue from a forge. Many clinkers in the assemblage are rounded with smooth surfaces, the result of having been thrust into the bosh or dowsed with water. Miscellaneous iron designates all the small, amorphous ferric fragments which cannot be identified. This class contains the leftovers of breaks, repairs and manufactures.

Also included among detritus categories are "plugs." Plugs are round pieces of iron with concave/convex faces that result from punching holes in iron plate (Spivey et al. 1977:222-3).

The distributions of the following various artifact types help discern the organization of the blacksmith shop. Iron bar fragments are distributed throughout the site (Fig. 10.13). However, a north-south line drawn down the middle of the excavation places 69% (131) of the fragments in the

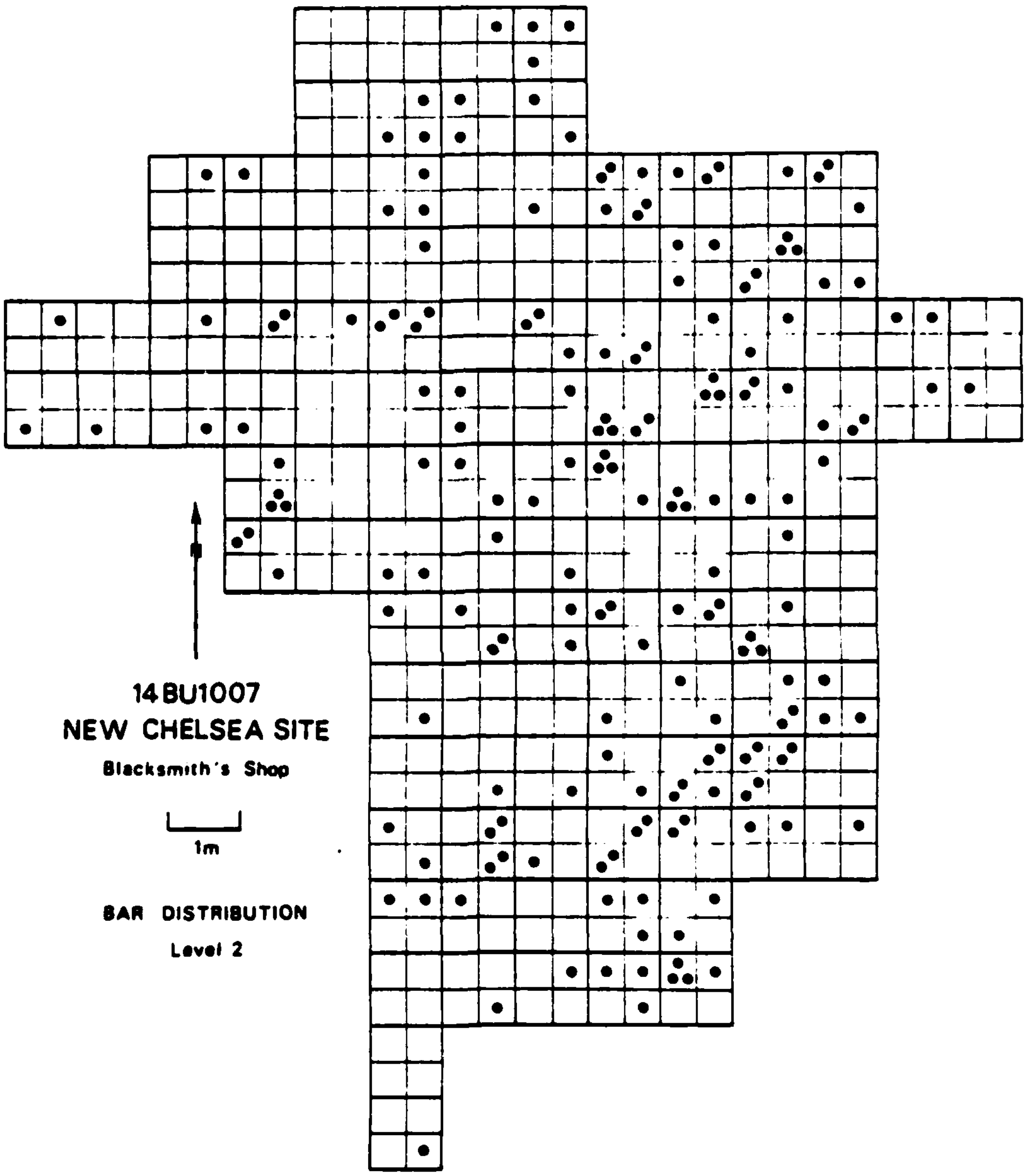

14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
BAR DISTRIBUTION
Level 2

Figure 10.13.

eastern half. Most of the pieces are distributed around Feature 2 and in the southeast units. There is also a quantity of material in the northeast. Specialized bar, sheet iron, and plugs conform to the bar distribution (Fig. 10.14).

Rod fragments represent a small dispersed class of artifact (Fig. 10. 15). There are no apparent concentrations. The most interesting apsect of the rod distribution is that much of the material occurs in the central area which contains little other material. The significance of this occurrence has yet to be assessed.

Clinkers occur throughout the excavation and, as noted in an earlier section, provide the clearest picture of the differential disturbance between levels 1 and 2 (Figs. 10.16 and 10.17). In level 2 there are three noticeably dense areas of material: (1) a concentration of small amounts in the northwest; (2) an accumulation of larger amounts of material in the southeastern units with an extension up the eastern periphery; and (3) the heaviest concentration directly over and within a one meter radius of Feature 2. However, in level 1, clinkers are randomly distributed.

Using the quantity of material present in level 2 as a guide, it is postulated that Feature 2 and the southeastern portion of the site were primary disposal areas for clinkers. The material extending up the eastern periphery probably represents a minor accumulation spreading from the southeast through a gradual shift in disposal patterns, purposeful and non-purposeful spreading actions by humans, and agricultural disturbance. There may have been some overlap between Feature 2 and the southeastern disposal area.

The material in the northwest may represent a primary disposal area. However, it would have been an area either used sparingly or not used until the latter part of the occupation.

Miscellaneous iron occurs throughout the excavation (Fig. 10.18). Its distribution clearly indicates primary disposal areas in the southeast portion of the site and around Feature 2. More than any other class of artifact, the miscellaneous iron class indicates an overlapping of Feature 2 and the southeastern disposal area. There is a dispersed area of relatively smaller quantities of iron (compared to the amounts in Feature 2 and the southeast) in the northernmost units of the site. In conjunction with other artifact distributions, this may indicate a smaller, less frequently used, disposal area.

Another small concentration of miscellaneous iron is located directly south of Feature 1, the postulated forge. The concentration occurs in between Feature 1 and Feature 3 and may be related to the activities that occurred around these features. This suggests that Feature 3 may be the anvil foundation and the small fragments of metal are the detritus of metal working that accumulated even though the area was cleaned.

With the exception of the small concentration between Features 1 and 3, the miscellaneous iron distribution indicates a relatively clean central area. The area runs roughly northwest to southeast and appears to extend more towards the west than the east.

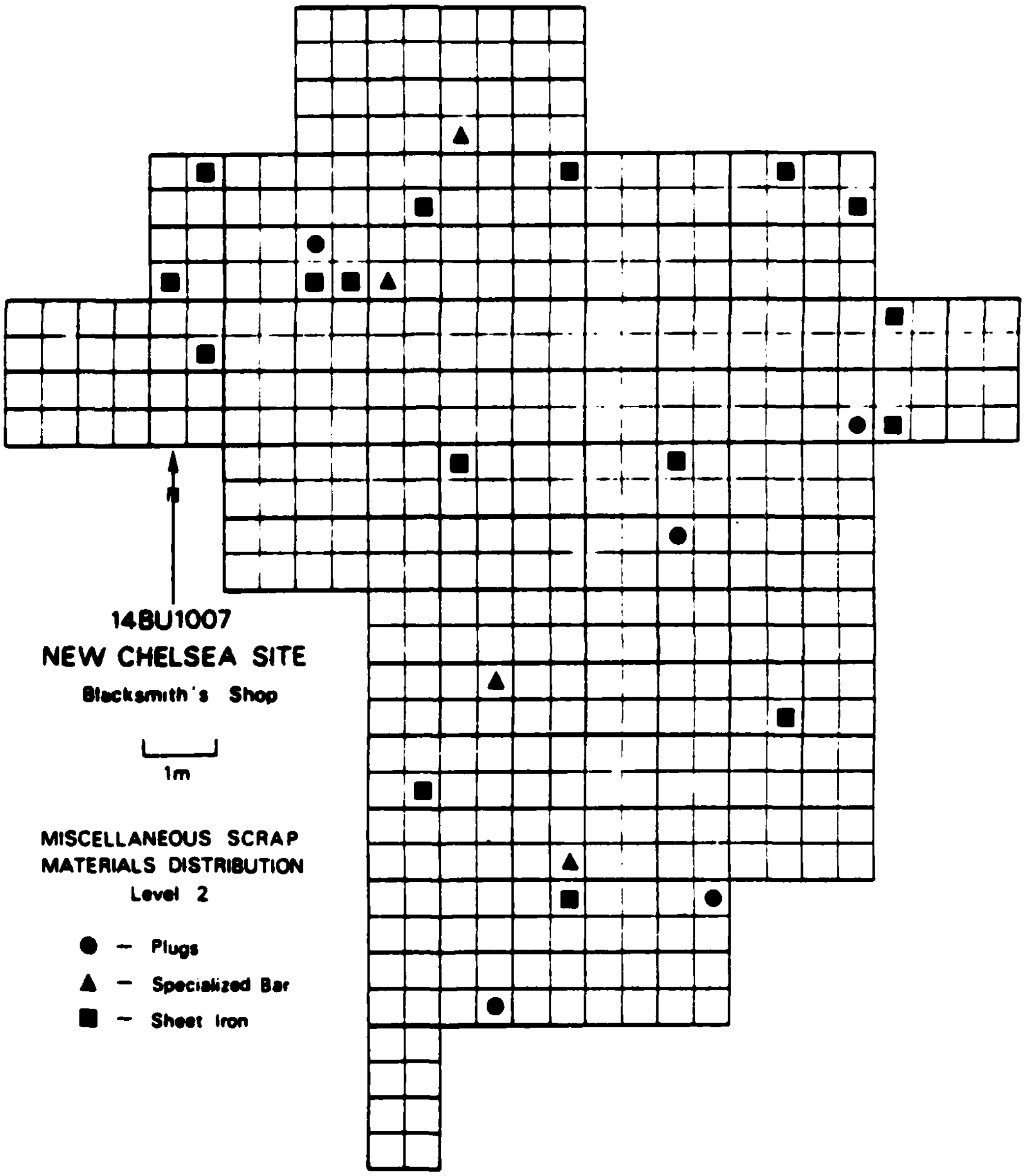

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
MISCELLANEOUS SCRAP
MATERIALS DISTRIBUTION
Level 2
— Plugs
— Specialized Bar
— Sheet Iron

Figure 10.14.

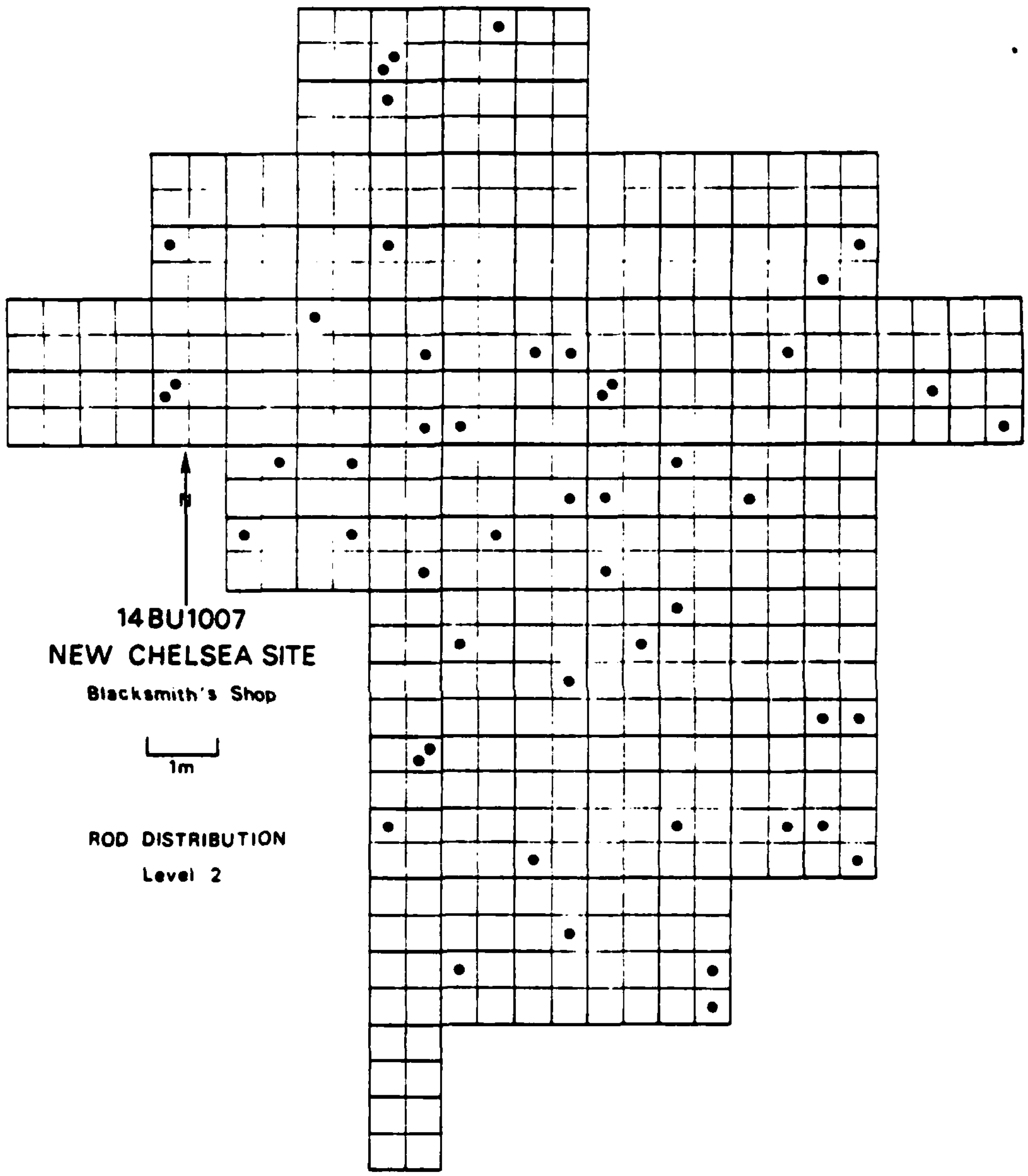

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
ROD DISTRIBUTION
Level 2

Figure 10.15.

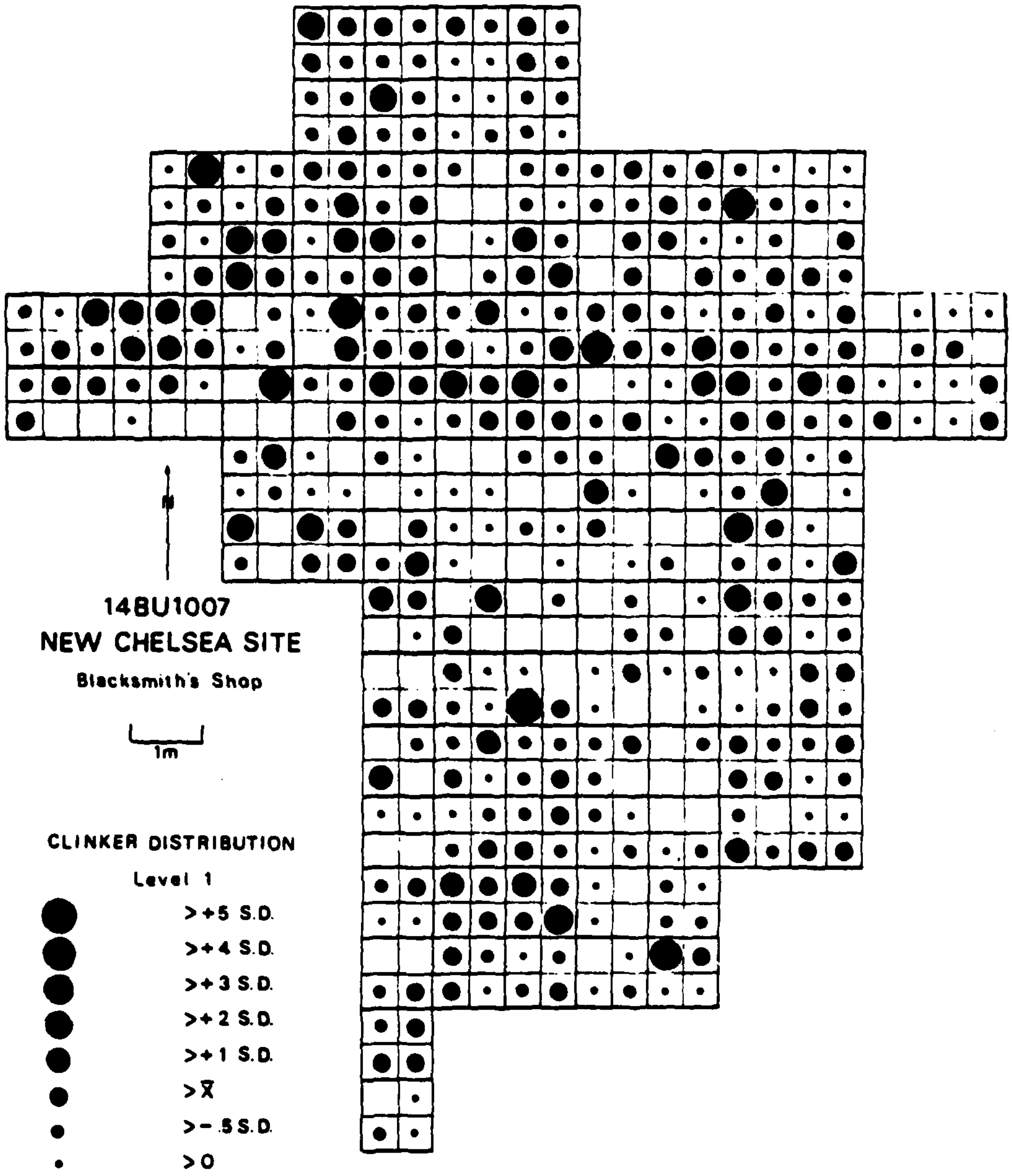

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
CLINKER DISTRIBUTION
Level 1
>+5 S.D.
>+4 S.D.
>+3 S.D.
>+2 S.D.
>+1 S.D.
>X̄
>-.5 S.D.
>0

Figure 10.16.

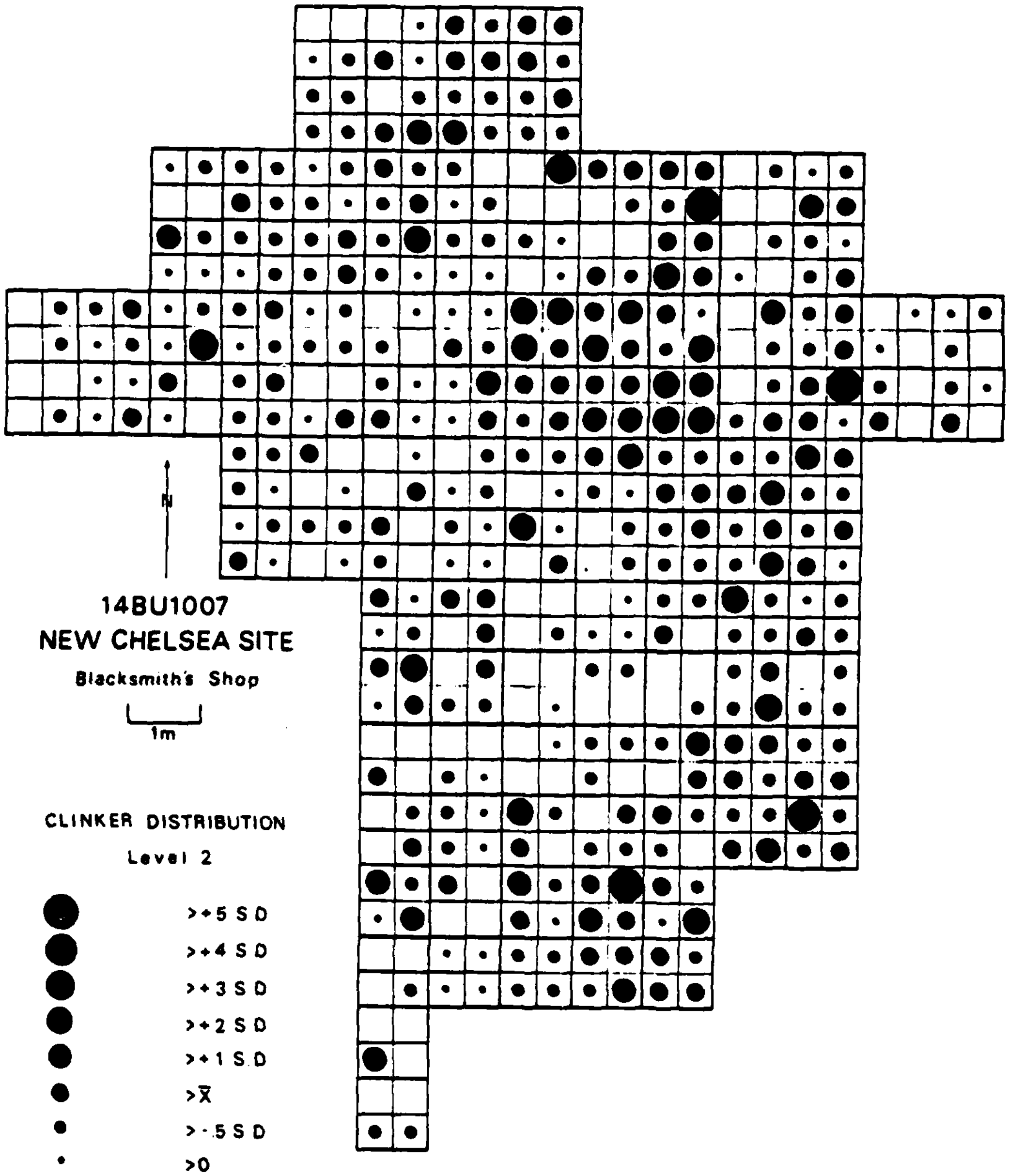

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
CLINKER DISTRIBUTION
Level 2
>+5 S D
>+4 S D
>+3 S D
>+2 S D
>+1 S.D
>X̄
>-.5 S D
>0

Figure 10.17.

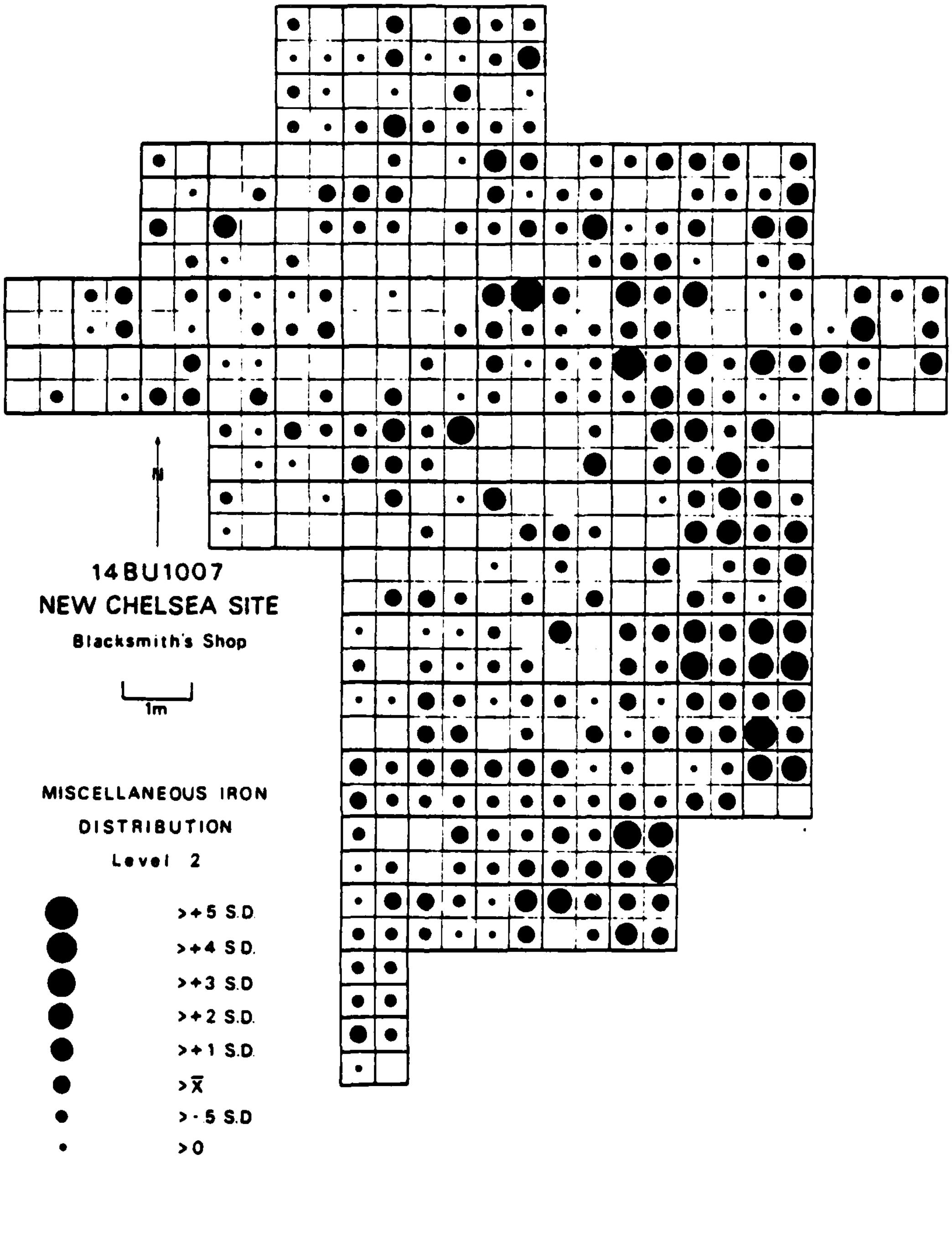

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
MISCELLANEOUS IRON
DISTRIBUTION
Level 2
>+5 S.D.
>+4 S.D.
>+3 S.D.
>+2 S.D.
>+1 S.D.
>$\bar{X}$
>-.5 S.D
>0

Figure 10.18.

Farrier Artifacts

Farrier refers to horseshoeing. The farrier assemblage is comprised of horseshoe nails (138) and horseshoe fragments (14). Only a few specialized tools aside from the smith's normal implements were necessary to shoe horses. Because farrier tools could not be distinguished from others, they are included in the blacksmith tool assemblage.

Shoeing horses was probably the single most important function of a blacksmith in the American west. It was a job that required considerable skill, as each shoe on each horse had to be individually fitted. A small error could ruin a shoe or horse or both. Horseshoes were generally good for only six months and so it was not uncommon for the professional farrier to carry the measurements of his regular customers in his head. The short lifespan for shoes also insured a fairly steady work source for the smith.

Horseshoes could be made by the smith from bar or rod, or blanks could be purchased from suppliers (cf. Spivery 1979). The same is true for nails. In this blacksmith shop, all the recovered horseshoe nails are common cut, which means they were produced by machine. The shoes, however, appear to be handmade with a four-three pattern, i.w., four holes on one side and three on the other (Fig. 10.19b). Several of the horseshoe fragments from levels 1 and 2 were being modified when they broke or were discarded (Fig. 10.19c). One specimen, A97111110002 (Fig. 10.19a), has been rounded on one end from use. What purpose it was adapted for cannot be determined, but it may have been farrier related.

None of the horseshoe fragments are sufficiently complete to accurately estimate size. The largest was possibly five inches from toe flange to heel calk; the smallest, three to four.

Distribution maps for horseshoe nails and horseshoe fragments are presented in Figures 10.20 and 10.21. One of the most unique aspects of the horseshoe nail distribution is that it is mutually exclusive of other square nails (see Square Nails). Both types of nails are present in the southern units, but most of the contiguous quadrants with horseshoe nails are in the west half, while regular square nails predominate in the central and eastern units. Horseshoe nails form an arc through the units north of Feature 2 while the other types tend to occur in units northwest of the feature.

The degree of spatial separation between the two major types of nails is probably related to function. Horseshoe nails and other nails are not used simultaneously and therefore would be disposed of separately. Disposal would take place within the general boundaries of the disposal areas but the specific focus of discard would be unique to each event.

Horseshoe fragments are a small, dispersed class of artifact. The sample size and nature of the distribution preclude any statements about clusters. It can be noted, though, that 79% (11) of the specimens occur south of Feature 1. Given the large number of horseshoe nails and bar fragments (the latter most likely include some horseshoe tips) in the southern portion of the excavation, the horseshoe fragment distribution suggests that farrier activities were conducted in that area.

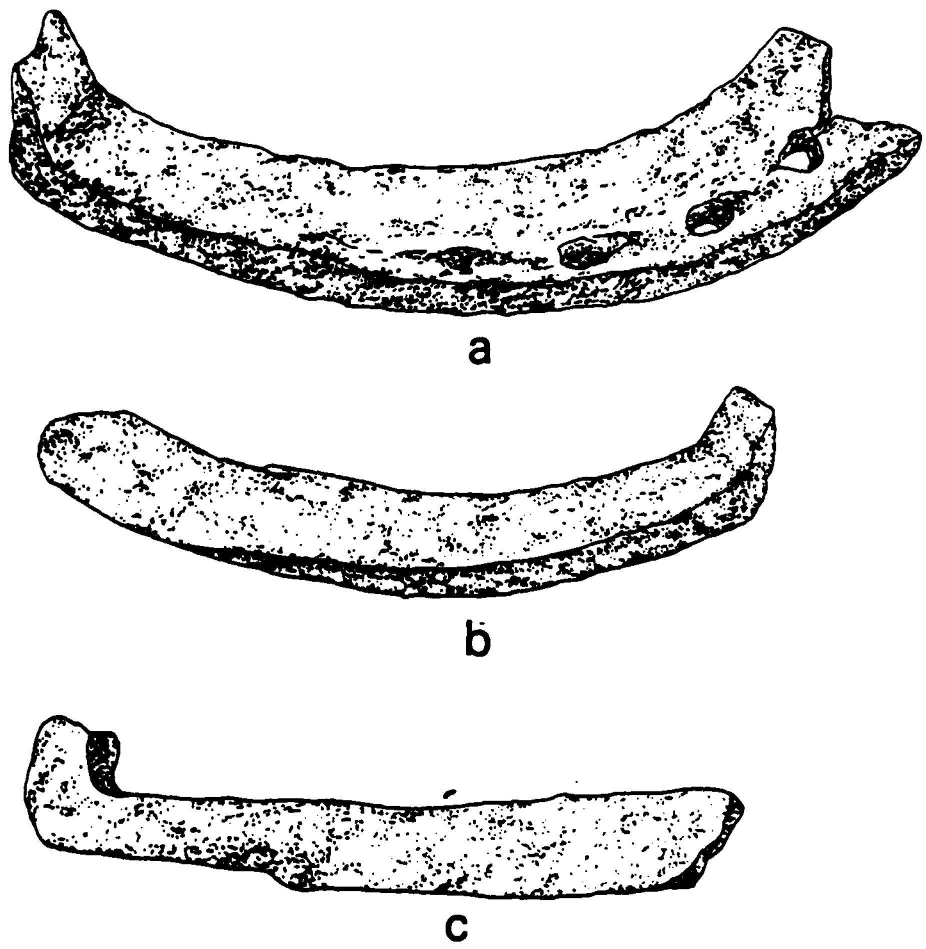


Figure 10.19. Farrier related artifacts: a. A97091410001, horseshoe fragment; b. A97111110002, horseshoe fragment modified for use as a tool; c. A97201 220003, horseshoe fragment, partially pounded flat. Actual size.

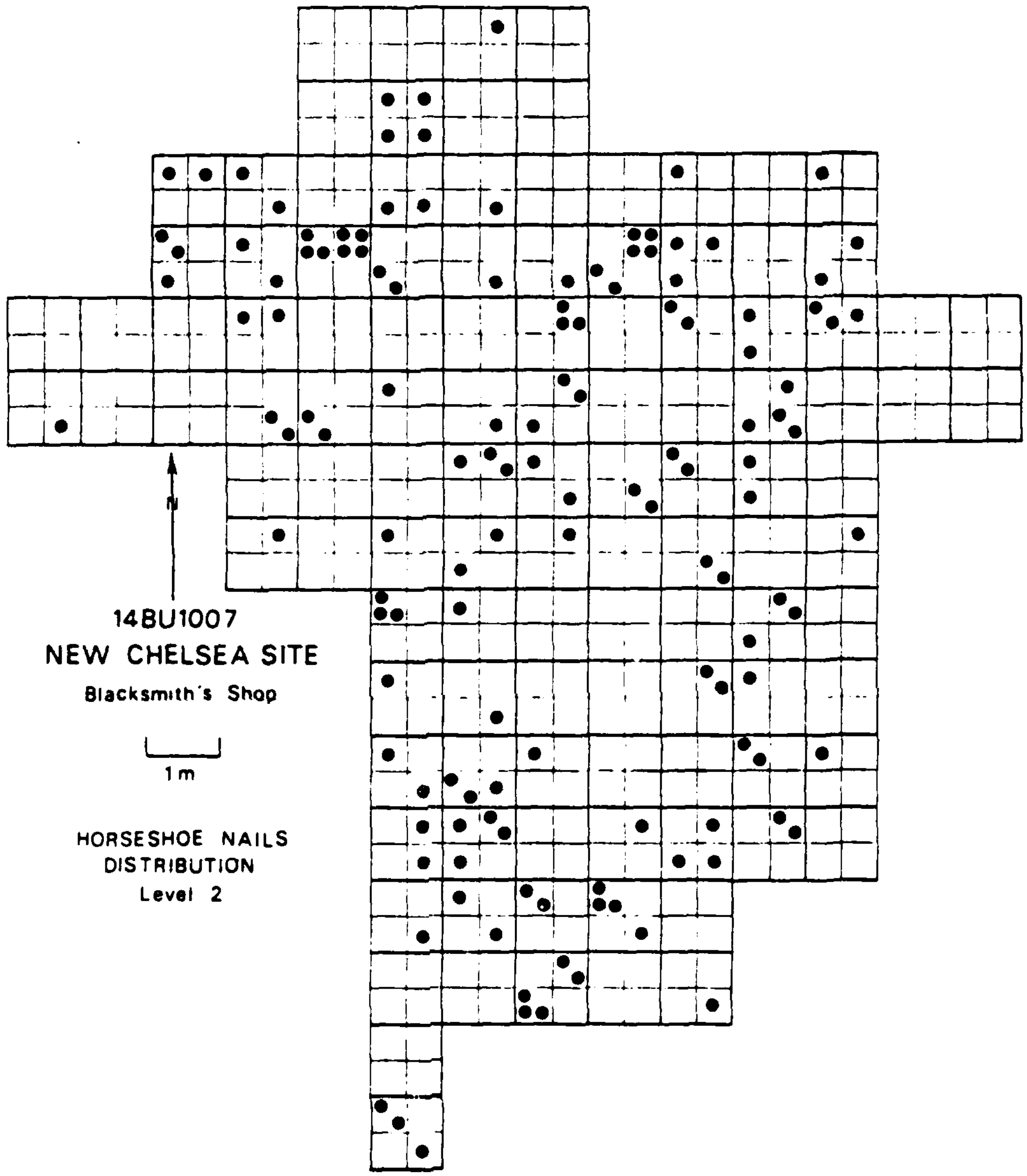

N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1 m
HORSESHOE NAILS
DISTRIBUTION
Level 2

Figure 10.20.

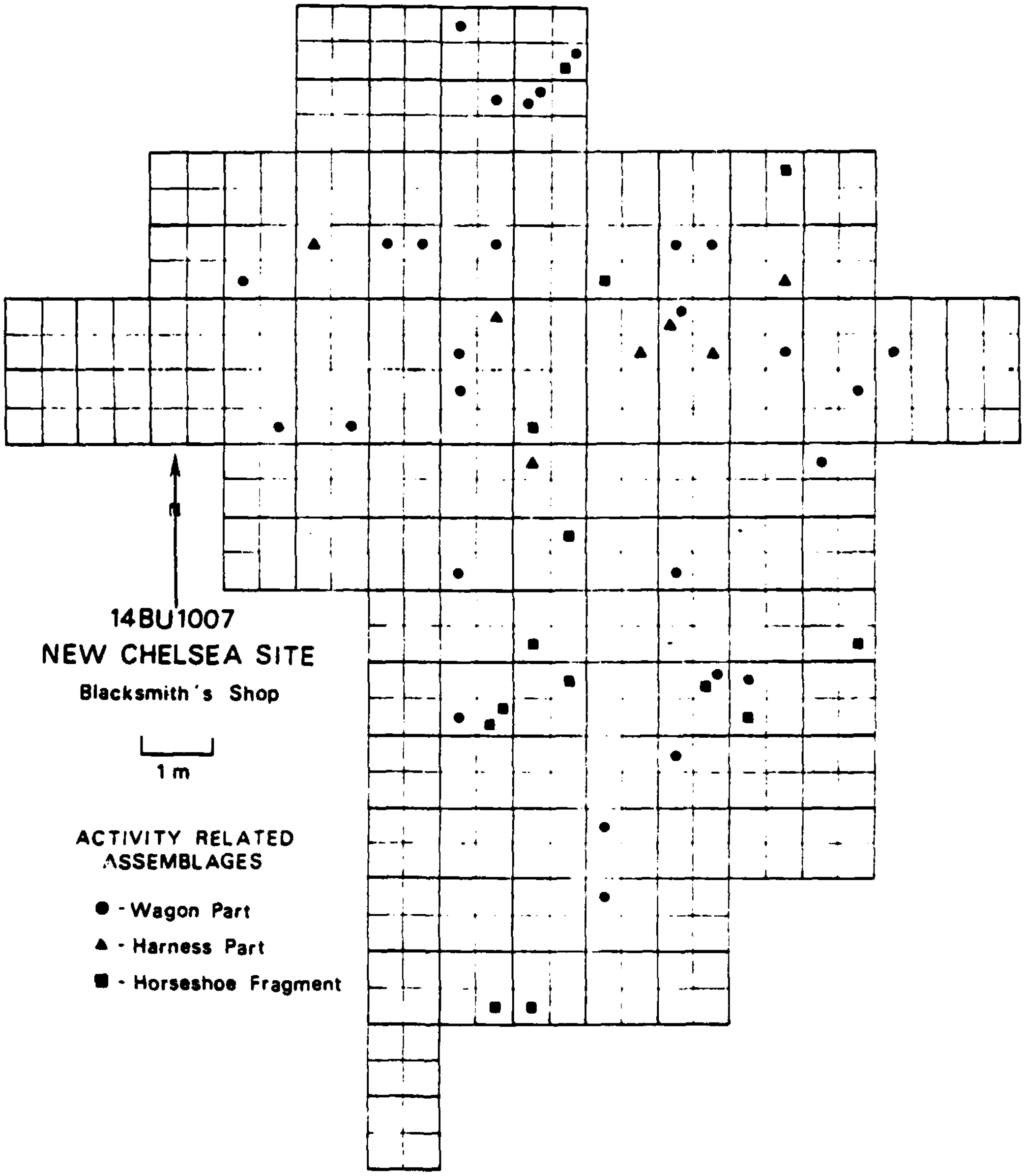

14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1 m
ACTIVITY RELATED ASSEMBLAGES
● - Wagon Part
▲ - Harness Part
■ - Horseshoe Fragment

Figure 10.21.

Wagon and Harness Parts

In classifying the artifacts contained in Table 10.6 as wagon and harness parts, several functional considerations were taken into account. All chain related specimens were included because, although multifunctional, their use with wagons and harnesses was among the most common. The wagon strap bar specimens, which are perforated iron bar fragments, could have been used for various purposes, but such material was an important wagon component. These are the most prominent examples but some of the smaller classes are also multifunctional. The inclusion of these specimens in this assemblage was based on a determination by means of literature search and experience indicating wagon and harness functions to be the most common (Fig. 10.22).

The small size of the assemblage should not be misleading. Wagon and harness repair was an important part of the blacksmith's work in a rural community. Two factors can account for the small sample size: (1) many wagon and harness parts could be reused; repair was more common than replacement; (2) lacking their wood and leather functional context, many wagon and harness parts may not have been recognized as such.

Because of the small number of specimens no concentrations can be defined. However, it can be seen in Figure 10.21 that 63% (19) of the wagon parts and 86% (6) of the harness parts occur in units either on the same north line as, or north of, Feature 1. This suggests that work involving wagons and harnesses may have generally been performed in the northern portion of the shop. This is further discussed in the section on nuts and bolts below.

Nuts and Bolts

The nuts and bolts assemblage contains fasteners that require a previously prepared hole or are threaded. Included are common nuts, bolts, rivets, and screws (Fig. 10.22). The composition of the assemblage is provided in Table 10.7.

A number of specimens may have entered the archaeological record accidentally through loss, but many show signs of having been cut or broken. Among the more interesting pieces believed to have been purposefully discarded are several nuts which appear to be rejects. Four specimens, two from each level, were being threaded at an angle and apparently discarded. There is no direct evidence that either bolts or screws were being produced; however, all the rivets appear to be hand-wrought.

Over 63% (23) of the nuts and bolts assemblage occurs on the same north line or north of Feature 1 (Fig. 10.23). Those specimens in the northern portion of the site also tend to occur more closely together than those in the southern units. The largest number of contiguous units containing nuts and bolts is in the area of Feature 2. There is also a small cluster in the units north of Feature 1. This occurrence tends to support the idea that wagon-related activities occurred in the northern part of the site as members of this assemblage were commonly used in such work.

Table 10.6. Wagon and harness parts.

Type	Counts Level 1	Level 2
Bracket	2	
Brake Lever	1	
Brake Rod		1
Carriage Bolt		
Chain Grab		1
Chain Horse Bit		1
Hub	1	1
General Harness	1	1
Metal Clevis on a tug		1
Rim Band	1	
Seat Link	10	6
Chain Swivel Clinch Pin	1	
Clevis		1
Clevis Pin	1	
Connecting Rod	1	
Doubletree Staple	1	
End Clip		2
Eye Pin	1	
Handle	1	
Harness Buckle	1	1
Harness Ring		1
Harness Snap		1
Brace	1	
Spring Seat Bracket	1	
Strap Bar	25	11
Wagon Box Iron, Bevel Edge		1
Wagon Staple	1	
	51	30

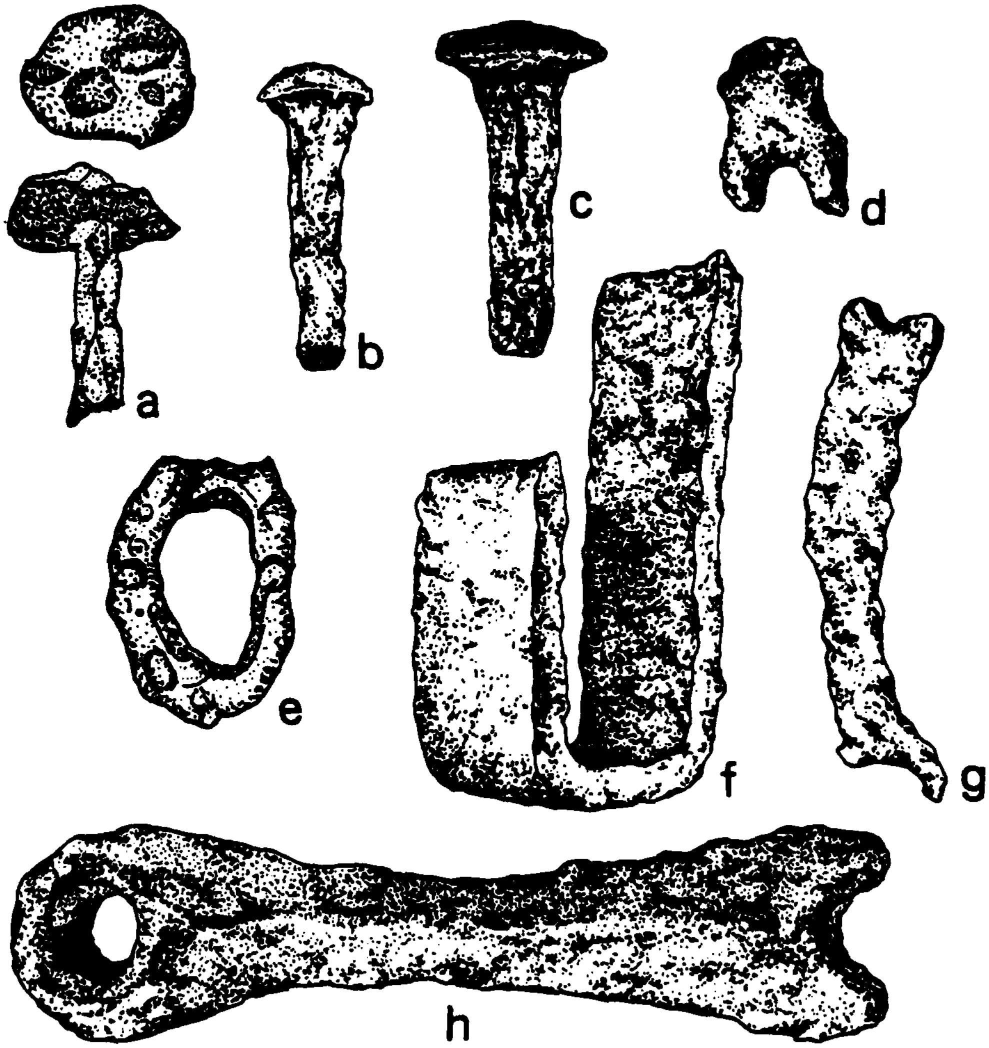


Figure 10.22. Potential wagon and harness related artifacts: a. A97143420001, rivet (two views); b. A97133310005, carriage bolt; c. A97087410003, tire bolt (?); d. A9720542007, chain swivel; e. A97115120003, chain link with imperfect weld (right side); f. A97140310002, spring seat bracket; g. A97088120002, harness bit; h. A97132310003, brake lever. Actual size.

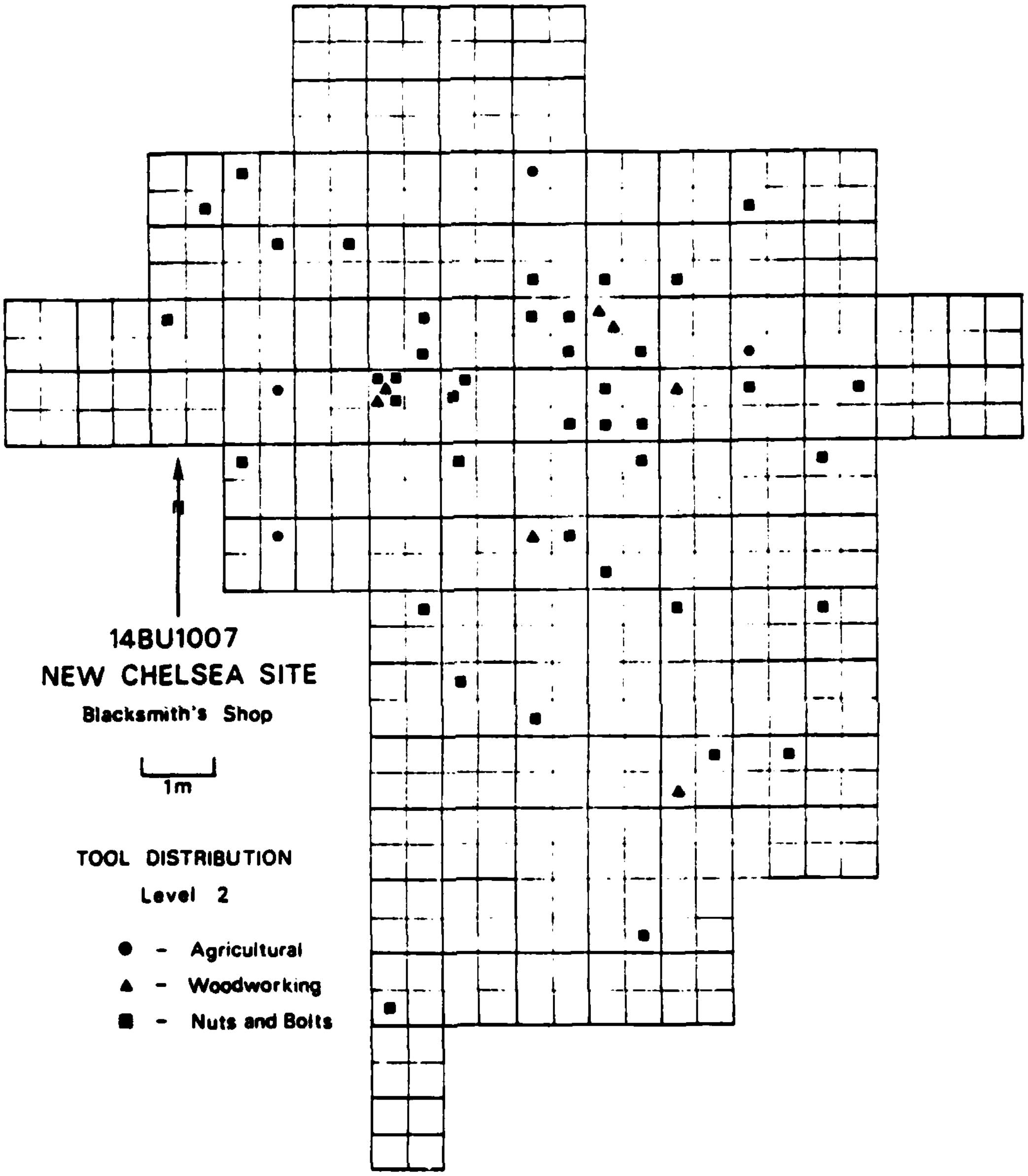

14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
TOOL DISTRIBUTION
Level 2
● - Agricultural
▲ - Woodworking
■ - Nuts and Bolts

Figure 10.23.

Table 10.7. Nuts and bolts assemblage.

Type	Counts Level 1	Level 2
Bolts	19	16
Countersink Head Screw		1
Eye Bolt	2	
Eye Screw	1	
Flathead Screw		1
Nuts	3	15
Rivet	4	9
Screw	1	
Tire Bolt (?)	1	
	31	42

Table 10.8. Woodworking tools.

Type	Counts Level 1	Level 2
Adze	1	
Chisel	5	3
Drill		1
Gauge	1	2
Spokeshave		1
	7	7

Woodworking Tools

Woodworking was one of the specialized tasks which a blacksmith was called upon to perform. The specialized toolkit is well represented by the New Chelsea assemblage, with the exception of saws and hammer (Table 10.8 and Fig. 10.24). Generally, the woodworking done by a smith was related to wagons, particularly their wheels. This assemblage is comprised of tools suitable for such heavy work. However, a hand-forged gouge from the southeast portion of the site has a narrow, grooved working tip of the type generally used for scroll work and other fine work.

Considering the size of this sample, it is not possible to note concentrations. Yet, it can be seen that 71% (5) of the specimens from level 2 are strongly associated with Features 1 and 2 in the northern units (Fig. 10.23). As it has already been pointed out that woodworking tools were involved with wagon work, this distribution supports the contention that activities involving wagons took place north of Feature 1.

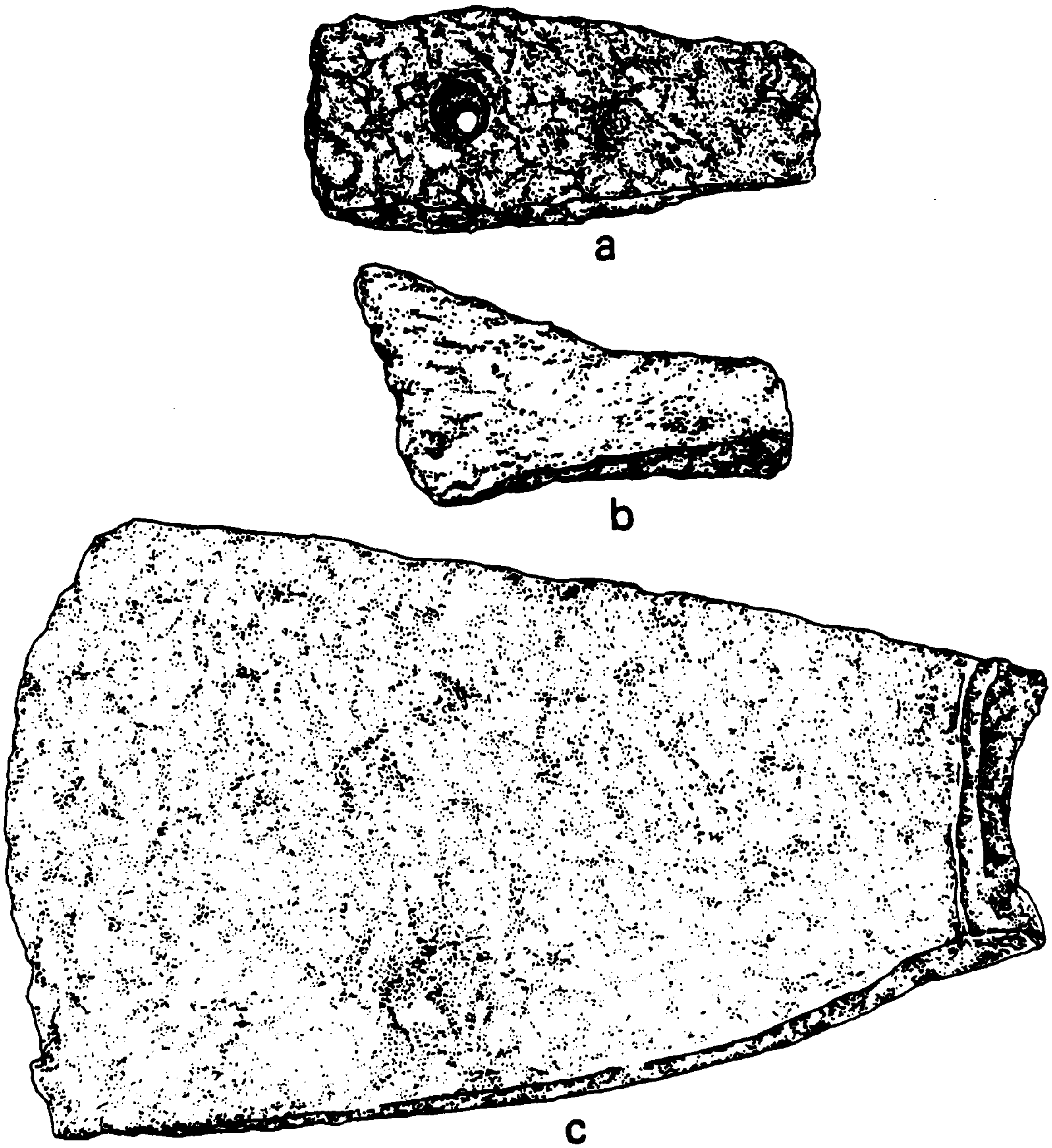


Figure 10.24. a. A97074420005, spokeshave blade; b. A97163310006, wood chisel (blank?); c. A97125210004, adze. Actual size.

Agricultural Implements

In an agrarian community such as Chelsea, a smith would have played a part in repairing and possibly manufacturing agricultural implements. The agricultural assemblage from the shop is comprised of 2 plow shear fragments and 10 mower blades. Of these specimens, only three mower blades are from the second level (Fig. 10.23). Mower blades have been recovered from throughout the wheat field in which the site is located. They are, therefore, considered intrusive. The plow shear fragments may have been related to the shop, but this cannot be certain.

Domestic and Architectural Assemblages

The artifacts listed in Table 10.9 and illustrated in Figure 10.25 have been grouped into a single assemblage because they generally relate to a habitation. In this instance, there was no habitation or residence present. These items are most likely indicators of additional activities that took place at the blacksmith shop. Most were recovered from the postulated disposal areas (Fig. 10.26).

Table 10.9. Domestic and architectural assemblages.

Type	Level 1	Level 2
Buckle	1	1
Cast Iron Stove Fragments		1
Copper Eyelit		1
Doorlatch Hook	1	
Hasp	1	
Hinge		1
Hook	1	
Iron Button		1
Iron Container Fragments	10	2
Kettle Leg	1	
Key		1
Knife Blade	2	1
Latch		1
Pintle	1	
Ovoid Strap Hinge Finial	1	
Scissors	1	1
Staple	1	3
Thumblatch	1	1
Tin Can	1	
Utensil Handle	1	1
Wire Latch		1
	24	17

The few items in the personal classes may well have been lost or discarded by the smith. Those items generally considered household goods are a select subset of such artifacts that could also be of use to a smith. Similar occurrences have been shown at another blacksmith shop (cf. Spivey et al. 1977).

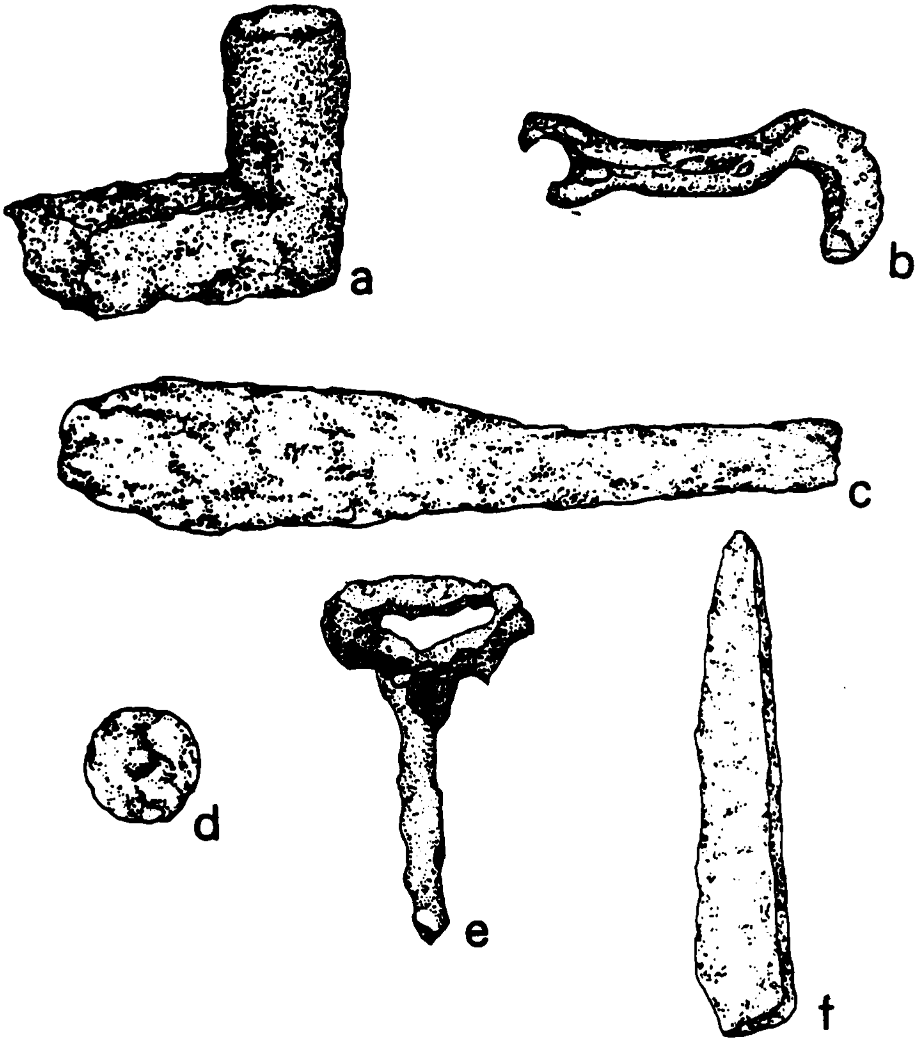


Figure 10.25. Domestic and architectural artifacts: a. A97156110002, pintle; b. A97183210001, latch; c. A97142320005, utensil handle; d. A97144320001, iron button; e. A97139220001, key; f. A97153410001, scissors blade. Actual size.

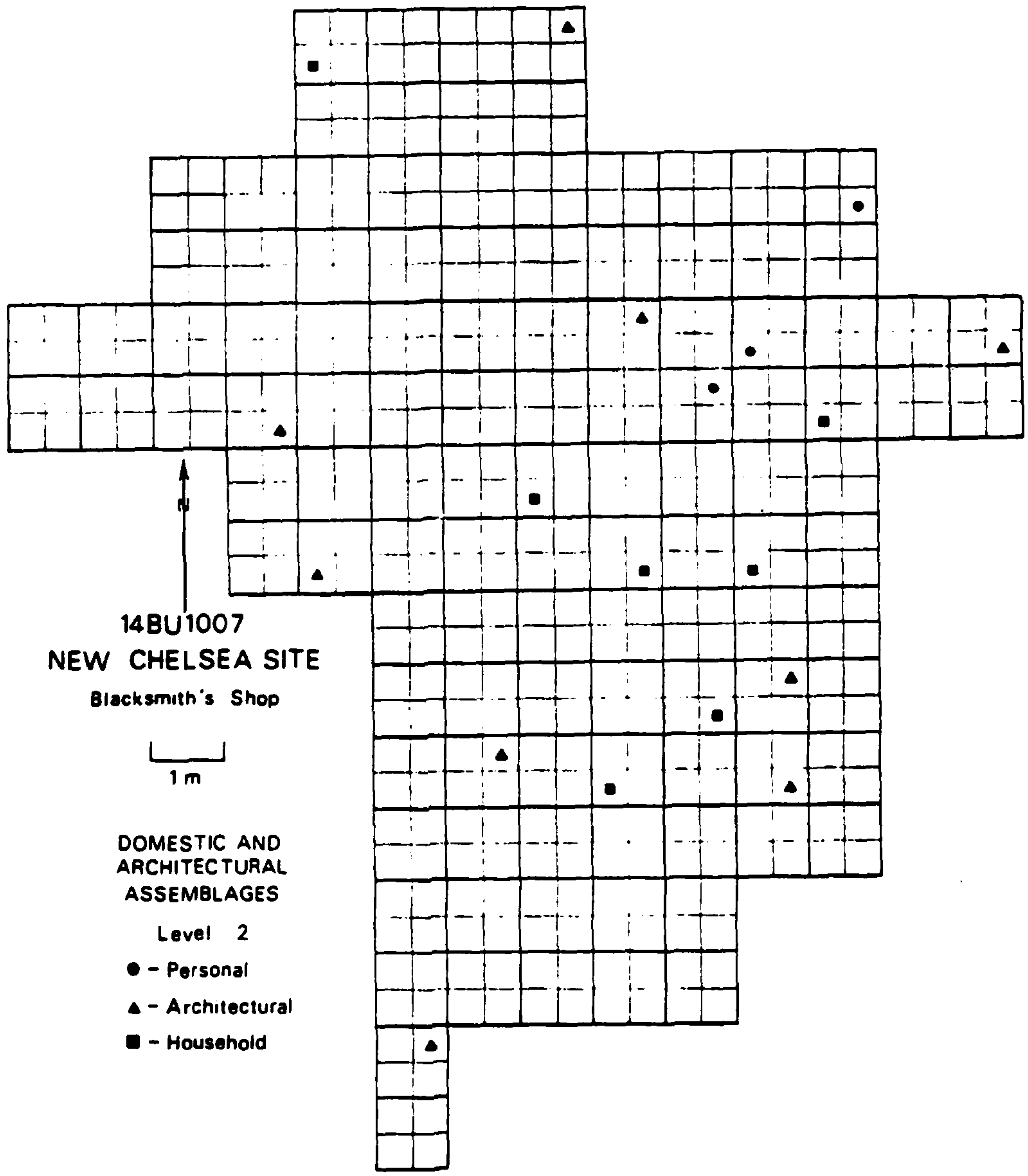

14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1 m
DOMESTIC AND
ARCHITECTURAL
ASSEMBLAGES
Level 2
● - Personal
▲ - Architectural
■ - Household
N

Figure 10.26.

The architectural specimens present a more difficult problem for explanation as no structures were present. Most are probably wagon and carriabe parts. The pintle, wire latch, and staples suggest that a fence or corral may have been present, but there is no direct evidence for such a structure.

Square Nails

As can be seen in Tables 10.10 and 10.11, a great variety of square nails, both handwrought and common cut, were recovered. The sizes represented cross-cut virtually all the functions for which nails are used in construction (cf. Fontana and Greenleaf 1962). Yet, there is no evidence of a structure around the blacksmith shop. This makes the explanation of the nails' presence difficult.

Table 10.10. Handwrought nails.

Type	Counts Level 1	Level 2
Fragments	33	35
2d	1	
4d	1	
5d	1	
6d		1
7d	1	2
8d	1	2
10d	2	
16d		1
30d	1	1
40d	1	
Scupper		1
Tack		1
Wagon (?)		1
	42	45

Table 10.11. Common cut nails.

Type	Counts Level 1	Level 2
Fragments	62	120
1d	1	
2d	1	
3d	6	2
4d	4	3
5d	4	1
6d		3
7d	3	3
8d	4	1
9d	2	1
40d	1	
Plancher		1
	88	135

Some of the nails could have originated from abandoned work benches and other such equipment that even an outdoor smithy was likely to have. Most may have derived from the smith's woodworking activity. The latter suggestion is strongly supported by the occurrence of many of the specimens in midden areas (Fig. 10.27), suggesting discarded fragments and pieces of wood.

The handwrought specimens may represent nails made for special purposes. These nails tend to be larger than the common cut specimens. It is interesting to note that over 60% (26) of the hand-wrought specimens are present in the units on the same north line as, or north of, Feature 1. This is the area previously suggested to be a possible wagon and/or woodworking area. If handwrought nails were produced for special needs during the course of these functions, this is the type distribution that would be expected. Common cut nails are evenly distributed over the site.

There is another interesting aspect of the handwrought and common cut nail distributions aside from that just noted. On a gross level, the two types appear to be co-distributed. However, in only 10 quadrants do they co-occur, which accounts for only 10% of all units containing handwrought nails and 26% of all units containing common cut nails. This distributional dichotomy cannot yet be explained.

Stoneworking Tools

Two stone chisel fragments were recovered, one from each level. Both appear to have been cut from their bodies. There is no evidence that the smith engaged in stoneworking and this was not a typical blacksmith activity. The smith may have been modifying the tool for a stonemason (there were a number of them in Butler County at the time) or for his own use.

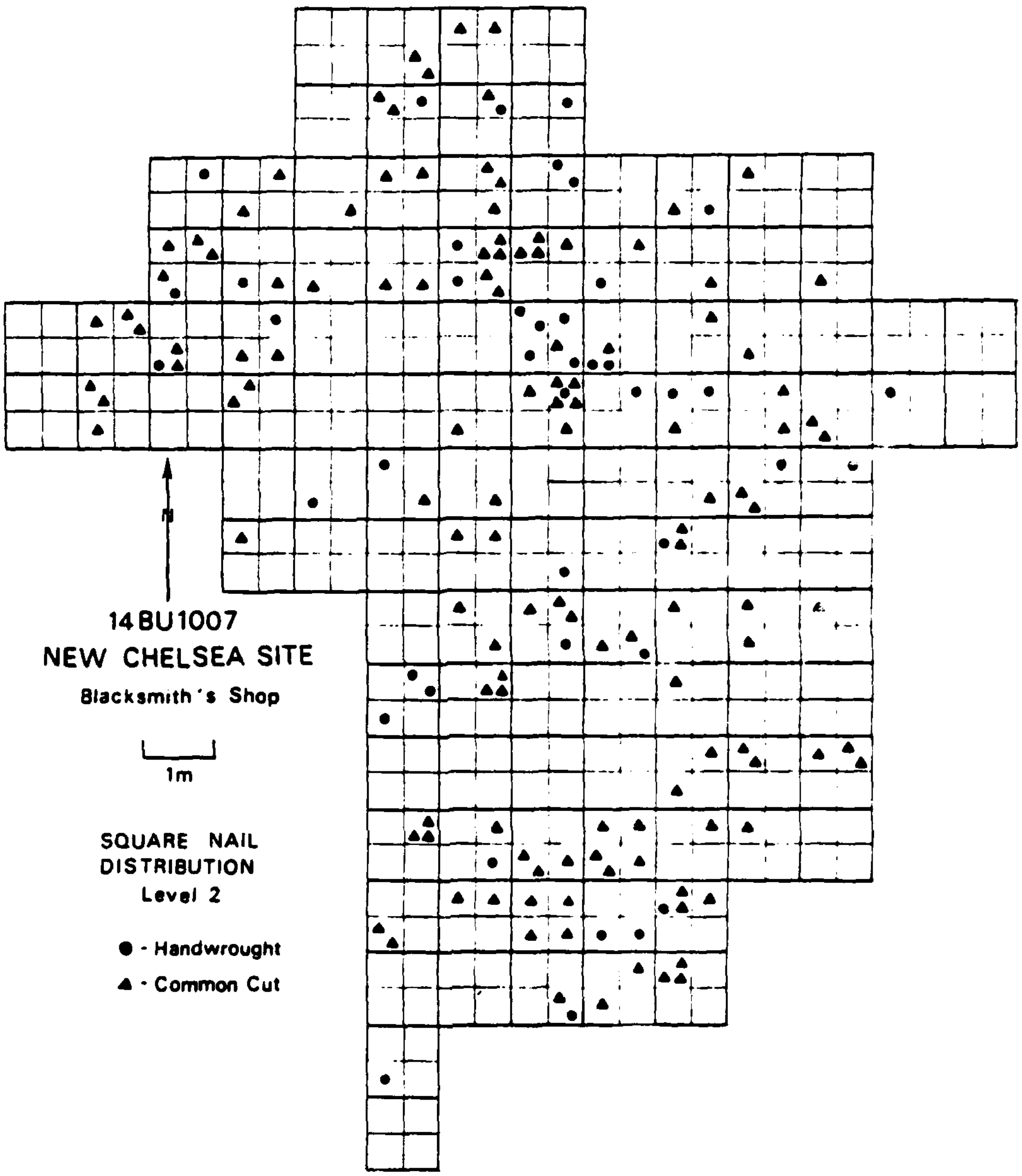
Arms

The base of a lead bullet recovered from one of the northernmost units is the only artifact in the arms assemblage. It is estimated to be in the .50 calibre range. The upper half of the bullet has been cut away. The smith may have cut it in order to use the lead for some other purpose.

Reconstructing the Blacksmith Shop

Using the distributions just discussed, it is possible to propose an activity area reconstruction of the blacksmith shop. Due to the nature of the assemblages, virtually all being comprised of discarded material, the primary distinctions that can be drawn are between disposal areas, work, and clear areas. Interpretations relating to specific function are extrapolated from the disposal patterns.

The two largest categories of blacksmithing debris, clinkers and miscellaneous iron, define the disposal perimeter within the site. Illustrated in Figure 10.28, this perimeter extends along the eastern portion of the site, including Feature 2. The heaviest concentrations of debris were in the southeast portion and directly over Feature 2. Disposal of other materials generally followed this disposal perimeter. Selective



N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
SQUARE NAIL
DISTRIBUTION
Level 2
● - Handwrought
▲ - Common Cut

Figure 10.27.

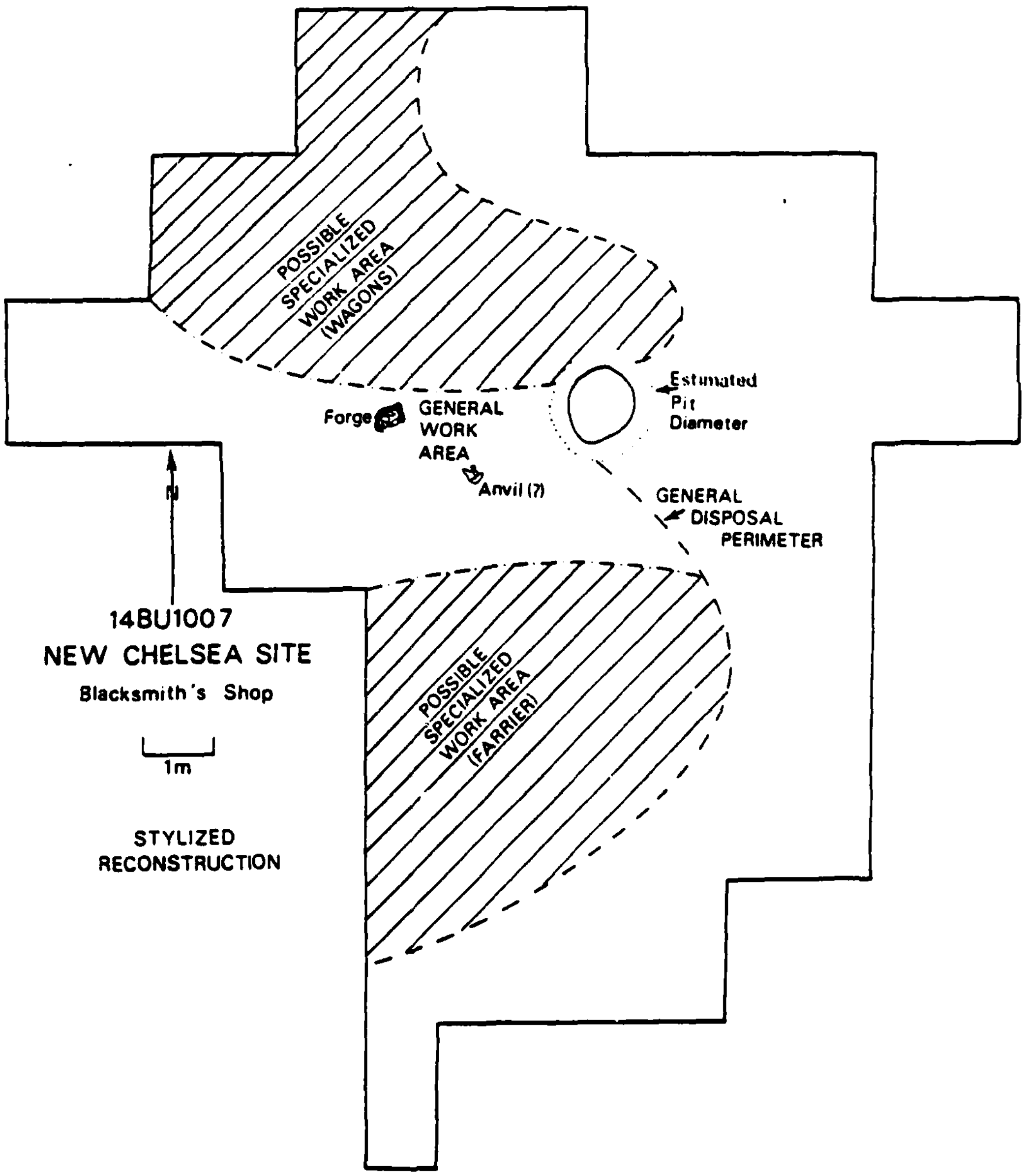

POSSIBLE SPECIALIZED WORK AREA (WAGONS)
Estimated Pit Diameter
Forge
GENERAL WORK AREA
Anvil (?)
GENERAL DISPOSAL PERIMETER
N
14BU1007
NEW CHELSEA SITE
Blacksmith's Shop
1m
STYLIZED RECONSTRUCTION
POSSIBLE SPECIALIZED WORK AREA (FARRIER)

Figure 10.28.

disposal of certain classes of artifacts within this general area suggests specialized activity areas that will be discussed below.

The defined disposal perimeter leaves a work area of approximately 40 square meters. Disposal patterns suggest possible specialized work areas within this large portion of the site. The preponderance of wagon and harness parts, nuts and bolts, and large nails (particularly the handwrought specimens) in the northern units of the site suggests that wagon related activities were conducted in that area. Such a location is convenient to the forge, Feature 1, which would have been indispensable in many such activities, particularly those involving the wheels.

The significant number of horseshoe nails and fragments in the southern units suggest that this may have been the area where farrier activities were carried out. A second concentration of horseshoe nails primarily northwest of Feature 1 suggests that some farrier activity occurred in the northern part of the site also. It is possible that these two patterns reflect localized farrier activity areas relating to the forge, i.e., hot shoeing took place on the northern part of the site, closer to the forge, whereas cold shoeing was practiced in an area removed from the forge in the southern units.

An area of approximately 3 square meters between Features 1 and 2 is relatively clean. This was the principal or general work area around the forge. All hot work and innumerable other activities would have been conducted in this small area. The need of the smith to move without hindrance in this important area dictates that debris not be allowed to accumulate. Thus, it is not surprising that Feature 2 appears to have been a favored disposal area, as it is conveniently located within kicking and tossing distance.

There is no evidence to suggest that any sort of building ever stood at the site. This was an open-air shop. Exposed to the elements as it was, it was probably operated only seasonally.

The shop did have a permanent forge, represented by Feature 1. It was a mortared brick and limestone structure of unknown shape. Although small, it was sufficiently large for most smith activities.

A blacksmith shop would have had an anvil. It is suggested that Feature 3 represents the foundation for a rooted anvil, but this is a tenuous interpretation. Another possibility, not previously discussed, is that Feature 3 was the pit that formerly held the block to which the anvil was attached. Subsequent to the removal of the block the hole was filled in with fieldstones. In either case, Feature 3 is situated in the ideal position for the anvil and no other interpretation can currently be offered.

It is assumed that work benches and/or tool storage apparatus were present, but there is no direct evidence. Other expected features that cannot be documented are a fuel storage area and a raw material stockpiling area. A general store was located in this portion of the town, and the smith may have acquired necessary fuel and raw materials there as needed without having to store his own.

The postulated organization of this blacksmith shop is not unusual. It was, in fact, standard practice to have specialized work areas. Of particular interest here is how well the Chelsea shop compares with an ideal depicted in the classic blacksmith text of the 19th Century (Richardson 1978:72-4). The plan places the forge and anvil in the center with the wagon work area to the north and the shoeing and plow floors to the south. The area encompassed was 24 feet wide and 44 feet long, which is extremely close to the area occupied by the Chelsea shop organization. This is not to say that the shop was copied from Richardson's text, but it does indicate that Chelsea's blacksmith had a proper, professional work organization.

The various types of activities that were performed at the shop have already been discussed. The manner in which tasks were accomplished merits attention, however. From the material culture inventory recovered, it can be deduced that the smith was parsimonious in use of his materials. The small tool fragments indicate a judicious reworking and reuse of tools. Non-tools that have been modified for use also reflect conservative tendencies as well as ingenuity. Most of the tool fragments appear to have been handwrought which indicates that the smith in many ways was efficient in minimizing waste. In sum, the smith who operated this shop demonstrates the same conservative approach to the use of raw materials demonstrated at other historic sites of varying function throughout the project area.

One of the more intriguing questions in historical archaeology is, "Who left this archaeological record?" Often documentary sources can provide the answer. In this instance, the answer is not conclusive, but the circumstantial evidence is strong. It is believed that this was the blacksmith shop of John Houser. The best supporting evidence is a description of the shop left by one of Chelsea's residents:

> John Houser came in sixty-nine and seventy and set up his blacksmith shop on a lot in front of (west of) the store there now. His shop had neither foundation, sides nor roof--the whole business was out of doors. He had few tools, but he made good use of them (Vaught 1916:110).

A final consideration is how this shop relates to others on the Great Plains. Only one other blacksmith shop has been recorded in the literature. It was a shop located in the Oklahoma panhandle during the latter part of the 19th Century (Spivey et al. 1977). Temporally, the two sites are comparable. However, the Oklahoma site, 34CM177 (the Mathewson House site) had a domestic occupation and structure associated. Due to the different natures of the two sites and different approaches in categorizing artifacts, a one to one correlation between assemblages is impossible. However, by carefully selecting types that are of unquestionable or strong association with a blacksmith shop, three broad assemblages held in common by the two sites were defined. These assemblages, metal working, farrier, and wagon and harness, are provided in Table 10.12. Although the raw

counts differ, the constituent percentages of the three assemblages are quite similar. The implication is that similar activities on different sites will produce numerically similar assemblages. Given additional sites, it may be possible to define a Great Plains blacksmith shop pattern much along the lines of the patterns that have been defined for historic sites in the eastern United States (cf. South 1977).

Table 10.12. Comparisons of assemblages from 14BU1007 and 34CM177.

	14BU1007		34CM177	
Assemblage	Count	%	Count	%
Metal Work	269	59.1	1111	56.1
Farrier	153	33.6	741	37.4
Wagon and Harness	33[2]	7.3	129	6.5
	455	100.0	1981	100.0

[1]Does not contain horseshoe tips category.
[2]Does not contain any artifacts from the nuts and bolts assemblage.

Conclusions

The Phase III investigations at the New Chelsea site have contributed towards the achievement of the overall project goals. By demonstrating that data can be extracted from the disturbed portions of the site, the Phase III work has opened new opportunities for research. The data recovered can aid in reconstructing Chelsea and making comparisons between this town and others.

The similarity between the Chelsea blacksmith shop and the Oklahoma panhandle smithy suggests that other similarities between these areas may be fruitful for research. Particularly interesting would be a comparison between Chelsea and Old Hardesty, an extinct panhandle town that is currently the only other Plains settlement that has been the object of archaeological research and the results published (Lees 1977). Certain general similarities can already be noted: parsimonious use of resources and a fairly scant archaeological record. More detailed comparisons will be possible after additional fieldwork has been accomplished at Chelsea.

Current research at Thurman, Kansas, an extinct community approximately 40 miles northwest of Chelsea, suggests that major variations may exist between cattle-oriented and agrarian-oriented Great Plains towns (Joe Hickey, director of the Thurman research project, personal communication). However, further comparisons will have to wait until fieldwork is completed at the two sites and the data synthesized.

In short, the research potential at the New Chelsea site is tremendous. Additional work in the disturbed portions of the site needs to be conducted and attention should be turned towards identifying any possible undisturbed areas. Samples from other types of occupations in the town

need to be gathered. The documentary data concerning the town, particularly tax records, still hold wealths of information that can be used to guide the excavation program by identifying significant areas within the town. Through a coordinated system of archaeological and historical investigation, Chelsea's storehouse of information can be tapped and significant new contributions can be made to the fields of anthropology and history.

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